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The teeth whitening in an age aspect: prevalence of the method use, substantiation of its carrying out and possible complications (clinical research)

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Abstract

The following article presents results of the clinical research on prevalence of use, justification of leading and development of possible complications due to the teeth' whitening. The main aim of the research is to study prevalence of apply of the teeth' whitening procedure among patients of different age groups in the Dental Department of the Odessa University Clinic, with a study on indications for leading the aforementioned procedure, as well as complications, that had been developed as a result of it. The research materials are: anamnestic data of patients from the University Clinic, who underwent the teeth' whitening procedure. Moreover, we had taken into account the following indexes: patient's age, presence of concomitant pathology, the data on leading the teeth' whitening procedure in the past. The main group was presented by 32 patients, who underwent the aforementioned procedure for the first time in their lives. The group of comparison is represented by 33 patients, who underwent the same procedure couple of times before (once, twice, three times or four times). The research methods: anamnestic, statistical. The methods of whitening, that had been chosen: hardware whitening, laser beam, thermocatalytic whitening and use of chemical catalysts. The analysis of anamnestic data, which was held, make us possible to postulate, that 5% of patients from both groups did not have any

complications after the teeth' whitening procedure. The other patients of the study groups though had a stable pain syndrome, the intensity of which is increasing in 24-48 hours after the procedure and last in average 5-7 days. The following article presents a data on a fact, what concomitant conditions and diseases of the oral cavity do stimulate a pain syndrome development more often and during what period of time. The current article also describes a character of inner-connections between pain syndrome and gender feature as well as presence of such procedures in the past. The authors had postulated, that the less traumatic and quite efficient method is oxidative cleavage of enzymes, by using which a stable long-lasting effect is reached, as well as there is a lack of pain after the procedure.

Key words: hardware teeth' whitening; laser beam; oxidative cleavage of enzymes; chemical catalysts; tartar.

Вибілювання зубів у віковому аспекті: поширеність використання метода, обґрунтування проведення та можливі ускладнення (клінічне дослідження)

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В статті представлено результати клінічного дослідження щодо поширеності використання, обґрунтування проведення та розвитку можливих ускладнень відбілювання зубів. Метою дослідження є дослідити поширеність використання процедури відбілювання зубів у пацієнтів різних вікових груп стоматологічного відділення Університетської клініки міста Одеса із вивченням показань для проведення процедури, а також ускладнень, що розвинулись після неї. Матеріалом дослідження слугували анамнестичні дані пацієнтів Університетської клініки, яким провели відбілювання зубів. При цьому звертали увагу на вік пацієнта, наявність супутньої патології, дані стосовно проведення відбілювання зубів у минулому. Основна група представлена 32 пацієнтами, процедуру відбілювання зубів яким проводили уперше. В групу порівняння увійшли 33 пацієнти, яким раніше проводилась процедура відбілювання зубів (одноразово, два рази, три рази та чотири рази). Методи дослідження: анамнестичний та статистичний. Обрані методи відбілювання: апаратне відбілювання, лазерний промінь, термокаталітичне відбілювання та використання

хімічних каталізаторів. Аналіз анамнестичних даних дозволив встановити, що 5 % пацієнтів обох груп дослідження не мали жадних ускладнень після проведення відбілювання зубів. У решти пацієнтів досліджуваних груп має місце стійкий больовий синдром, інтенсивність якого підсилюється через 24-48 годин після процедури і триває у середньому 5-7 діб. В статті досліджено, які супутні стани або захворювання ротової порожнини частіше стимулюють розвиток больового синдрому і в який термін. Також описано характер взаємозв'язку між больовим синдромом і гендерною ознакою та наявністю процедур у минулому. Авторами показано, що найменш травматичним і дієвим методом є окислювальне розщеплення ферментів, при використанні якого досягається стійкий тривалий ефект та відсутній інтенсивний біль після процедури.

Ключові слова: апаратне відбілювання зубів; лазерний промінь; окислювальне розщеплення ферментів; хімічні каталізатори; зубний камінь.

The relevance of the current topic is determined by unrestrained development of aesthetic dentistry and widespread promotion of the healthy teeth' natural beauty in the anterior oral cavity [1, 4]. More and more often patients direct to dentists their questions about darkening of teeth, development of pigments and stains on enamel, that could not be removed at home [2]. Modern society provides its adjustments, that is why the hallmark of communication nowadays is primarily a bright smile as an indicator of human's well-being, as well as a factor, that enhances self-esteem and social adaptation [3, 7]. In addition, for a certain category of people speaking about attractive smile we do not have to mention only and exceptionally their aesthetic accounting, but their realization in a personal life as well [4, 10]. The relevance of aforementioned topic is also tightly connected with the fact, that in most of cases, patients with dental discolors suffer from inflammatory periodontal disease as well as require more deep research and further treatment [5, 9]. It is commonly known, that the whitening can lead to hyperesthesia of the teeth [6, 8]. However, on the current stage of development of the dental science there were no main criteria provided to substantiate carrying out whitening, likewise there were no described categories of complications, that could develop alongside.

The main aim of the research: to study prevalence of use of the teeth whitening in case of patients of different age groups from the Dental Department of the University Clinic, Odessa, Ukraine, with a study on indications for the procedure, as well as complications, that had been developed after.

The research material: we had studied anamnestic data of patients of the Odessa University Clinic, who underwent teeth whitening. Namely: an age aspect, presence of concomitant diseases, previous procedures of whitening as well as oral cavity diseases, that took place for the moment of the procedure or were observed in the past (all necessary data was collected by analyzing individual cards of patients of the Clinic with a written consent for access to database, which had been taken as from the patient, as from the dentist as well.

As an energy source we had used a blue light spectrum (hardware whitening), laser beam (laser whitening), heat (thermocatalytic whitening), and, in some cases, chemical catalysts.

All patients were divided into two groups. The first group, main one, consists of 32 people, who underwent the procedure of whitening for the first time. The group of comparison is represented by 33 patients, who had previously applied for this procedure to the University Clinic.

By gender, the patients from both groups are divided as follows: 55% -men, 45% - women. The division of patients is presented in the Table 1.

Table 1 - The division of patients from study groups according to the age

Gender	25-35 y.o.	36-45 y.o.	46-55 y.o.	Total
Men	12	9	9	30
Women	15	7	3	25
Total	27	16	12	55

The data which was presented in the Table 1 reveals a predominance of patients from the age group of 25-35 among general number of patients regardless of gender.

In the main group patients underwent a procedure of the teeth whitening for the first time. Moreover, in case both of men and women, there were no concomitant pathology of the oral cavity observed.

Among patients from the group of comparison: 14 people underwent this procedure for the second time, 11 patients - for the third time with an interval of 1 year between each of them, 8 patients underwent a procedure for the fourth time with a time interval of 1 year or more. We have to notice, that, in case of patients from the study group on an age subgroup of 25-35 y.o. along with darkening of the teeth there were also pigment spots from food dyes, the presence of tartar and plaque of smokers. Among men in the age of 36-45 y.o. the were

changes in the teeth color due to trauma as well as tooth discoloration because of improper dental treatment. As concomitant conditions in case of women of this age group we could name: tooth discoloration, which is determined by using medical treatment as well as a presence of microorganism in the oral cavity.

Regardless of gender, in case of people in an age group of 46-55 y.o. the following features took place: tooth discoloration as a result of using drinking water with a large amount of iron, as well change if the teeth colors by the products of hemorrhagic pulp destruction. In other words, all concomitant conditions, that had been mentioned above, were indications for the teeth whitening procedure in case of patients from the study group.

In case of patients from the study groups there were no chronic pathology found (likewise chronic disease of kidneys, liver, pancreas, or disorders of the main metabolism), as well as there were no anamnestic data on patients' staying in areas with a high fluoride content. We have to emphasize also, that there were no hereditary or acquired infectious diseases revealed, which could contribute to early tooth decay.

During conversation with patients from the both study groups we had found out, that 11% of patients brush their teeth after each meal as well as after waking up; 39% of respondents brush their teeth twice a day (in the morning and in the evening); 50% - only once a day, in the morning immediately after waking up.

We had noticed the presence of dental hyperesthesia after the whitening procedure in case of 95% of people from the group of comparison as well as in case of 80% of patients from the main group. Moreover, we have to underline, that the intensive pain was shown in 24-48 hours after whitening procedure, and became more intensive in 48 hours, as well as it did not change its nature within 4-7 days after medical procedure.

The research methods: anamnestic, statistical.

The results, that had been obtained: the process of data collecting in case of patients from the main group was held directly after the whitening procedure as well as after 24 and 48 hours. The division of patients into groups according to the whitening method is the following one: 25% - hardware whitening; 25% - laser whitening; 25% - thermocatalytic whitening; 25% - oxidative cleavage of pigments. In other words, groups were compiled in a such way in the aim of obtaining reliable results.

As an energy source we had used a blue light spectrum (hardware whitening), laser beam (laser whitening), heat (thermocatalytic whitening), and in some cases - chemical catalysts.

In case of all patients from the study groups we could notice a development of dental hyperesthesia as a result of abnormal structure of the tooth and periodontal tissues. In 24 hours in all cases an acute or moderate pain sensitivity appeared under the influence of chemical (sour products), thermal (cold water, ice-cream, cold air) or mechanical (toothbrush, floss, toothpick) stimuli.

Let us consider a character of the course of period after undergoing a procedure as well as a possible development of complications in case of patients from the study groups.

Thus, there is 5% of patients from both of groups, who did not have any specific sensations after whitening procedure regardless of its method. Other patients started to suffer from pain in 24-48 hours after the procedure. Moreover, we have to notice also, that in 65% of cases we could also notice bleeding gums before a pain syndrome, in case of 35% of patients though we could notice likewise gums' bleeding as well as enlargement of the lymph nodes of the neck before the pain syndrome. In all aforementioned cases pain caused a loss of appetite, decrease of working activity, as well as general weakness. In 48 hours all patients have noticed an increase of the pain syndrome, what consequently had led to persistent sleep disorder in 45% of cases as well as required the use of analgesics. Thus, 25% of patients have taken tempalgin or aspirin, 35% though have taken even sleeping pill.

35% of patients from the main group went to the doctor with pain complaints. any of them did not require to use narcotic analgesics or other specific therapeutic measures with using physiotherapy equipment.

In other words, we could say, that regardless of chosen whitening method all patients had the same complaints, while the character of pain was typical one and did not require specific medical treatment.

All patients from the main group came for a review 10 days after whitening procedure, where a survey as well as a necessary data collecting was held. It had been done in the aim of using this data during our study on the group of comparison. For that time it had been already no complaints from the side of oral cavity, that could be determined by the whitening procedure, which took place. The teeth' enamel was not damaged. According to the medical documentation (the clinic patients' cards) it is known, that there is no patient from the study group, who came to doctor with complications or other complaints because of the whitening procedure, which was held, during 4 months after the aforementioned procedure. 4 month later 3 patients have come to the the Clinic in the aim of attending prophylactic examination, while 5 patients have come having superficial caries of the sixth teeth.

Likewise it took place in the main group, in case of group of comparison there were no pain syndrome or different types of complications in 5% of cases. In 95% of patients from the study group a presence of the aforementioned suffering is directly dependent on presence of the concomitant pathology as well as on number of procedures, that were undergone before.

In case of patients from the group of comparison a pain syndrome had been developing in average in 24-48 hours. If we are going to consider this process under the prism of hours, we could find out the following link: the patients who had undergone a whitening procedure for the second time started to suffer from pain syndrome in 30-48 hours after the procedure; patients, who were prescribed to undergo a procedure for the third time started to suffer from pain syndrome in 25-29 hours; while, finally, people, who had undergone a whitening procedure for the fourth time started to suffer from pain syndrome already in 24 hours after it. Thus, we could see a direct link between number of whitening procedures, that were held before from one side, and a speed of developing of the pain syndrome from another side.

There were no admitted characteristic features of pain development depending on gender or age of the patient. The same feature was admitted towards method of whitening.

The nature of pain in all observations was persistent with a tendency to increase over time. In case of all patients an increase of pain was admitted. In 65% of cases in 30-48 hours after the procedure pain was absolutely unbearable, did not allow a patient to rest at night and could be stopped only by taking painkillers. 45% of patients from the study group came to the dentist with pain complaints. All patients have undergone a treatment of the damaged areas by treatment high in fluoride and calcium; as well as they were prescribed to undergo physiotherapy procedures with vitamin complexes. In 25% of cases dentists had led mineralization of sensory areas by applying remineralizing therapy. 15% of patients were prescribed to use desensitizing gels of prolonged action; for 5% of patients a specific universal dental mouth guard was prescribed with using a desensitizing gel alongside. In 3% of cases the aforementioned dental mouth guard was prescribed as a result of pain development after the whitening procedure, that had been held before (primarily, it is related to people, who had undergone a procedure for the third or fourth time already in their lives).

If we are going to evaluate a presence of connection between gender feature and developing of the pain syndrome, we could come up with the following solution: in case of men pain takes place more often, than in case of women. In percentage terms it looks like 75% and 25% respectively.

There is a direct connection between appearing of pain and existence of concomitant pathological conditions in the oral cavity. In case of patients from the age group of 25-35 y.o., who had tartar and smokers' plaque, the pain was developing in the early periods after undergoing a procedure, and was stopped by taking painkillers and special pastes.

In the meanwhile those patients, who had dark teeth as a result of improper dental treatment, have required to undergo a procedure with a use of chemical catalysts. In 30 hours after the procedure all of patients went to dentist complaining about pain at night; starvation due to persistent pain syndrome and swelling of gums; increasing of the temperature up to 37-37,5 ° C. Three patients have undergone an oral rehabilitation and they were rescribed also to use a long-acting desensitizing gel.

Three women from the group of comparison have the teeth' discoloration as a result of taking tetracycline antibiotics. Moreover, we have to notice, that in case of 50% of teeth there is uniform darkening of them on all sides. To add, two patients have undergone a whitening procedure for the third time; one of them - for the fourth time. All patients noticed, that teeth' darkening between procedures was developing earlier, than in 7-8 months.

Patients of the age group of 46-55 y.o. from the group of comparison, whose teeth' color changes were determined by products of hemorrhagic destruction of the pulp have started to feel a pain already 15 hours after the procedure. In 24 hours after the whitening procedure though, regardless on chosen whitening method or person's gender, all people have suffered from a persistent severe pain, to decrease which it was necessary to take painkillers and gels. 5 patients have come to the Clinic for aid. All of them were prescribed to use dental mouth guards and desensitizing gels during 7-10 days after the procedure.

Speaking about chosen method of whitening, there is a clear direct connection between the method, which was chosen and development of the pain syndrome. Let us analyze all methods separately.

The hardware whitening was effective in case, if the teeth discoloration was developed as a result of lifelong pigmentation and age-related changes in the teeth. Patients, who have undergone this method started to suffer from persistent pain syndrome already in first couple of hours after the persistent, while the pain of the highest severity took place in 24 hours after the procedure. Moreover, all of the patients were not able to drink hot drinks or eat. The pain was stopped by taking painkillers and special gels of the prolonged action.

After undergoing the procedure of teeth' whitening using a laser beam, a pain syndrome was developing in average in 28-30 hours, and did not require taking painkillers. All patients have used desensitizing gels of the prolonged action after the procedure.

The thermocatalytic whitening was held in case of slight roughness of individual areas or the tooth on the background of superficial foci of the enamel discoloration. The unstable pain of a low intensity was appearing 30-35 hours after the procedure, and did not require taking any special painkillers.

The pain after whitening using chemical catalysts was developing 10-15 hours after the procedure already, it was persistent and led to sleep disorders in 50% of observations. We have to notice also, that the pain of the highest intensity was noticed in case of patients with artificial dentures, with the presence of exposed areas of dentin or with damaged teeth.

Thus, we had studied a clinical data of patients from different age groups, who underwent the teeth whitening by applying different methods. By analyzing an obtained data we could say, that the efficiency of whitening depends on etiological factor as well as on severity of discoloration. That is why, the type of whitening procedure as well as presence of indicators for this procedure is always up to dentist and his empirical experience, as well as up to his complete understanding of all possible consequences of this intervention, such as primarily - enamel defects and tooth sensitivity. According to the data of the modern literature, the oxidative cleavage of pigments is an atraumatic and effective method of whitening {11, 12}, what was confirmed by our work. Indications and contraindications for whitening procedure depend on reasons and degree of the teeth' darkening, general patient's condition as well as individual features of the oral cavity {13, 14}. While assessing the type of discoloration, the dentist has to have a clear idea about changing of teeth' color on the background of influence of exogenous and endogenous factors, as well as, he has to apply this knowledge for formation of the method of further medical treatment in an aesthetic and restorative dentistry {15}. All modern ideas, that had been mentioned above, towards indications and choice of whitening methods are applied in the University Clinic in Odessa, as well as, further they will contribute to development of the aforementioned research area.

Conclusions.

1. Men prevailed among patients from the both study groups (55% from the general number of patients). According to the age, people in an age group of 25-35 regardless of gender, prevailed.

2. In case of patients from the group of comparison after whitening procedure we could notice a pain syndrome of different intensity and duration.

As perspectives of further research we could name: postulation of the enamel's condition as well as a nature of its hypersensitivity after whitening procedure in case of

patients in different age; study on influence of the whitening system on the mineralizing potential of the oral fluid as well as stage of development of the teeth' demineralization; developing effective measures to improve methods of clinical rehabilitation and prevention of lesions of the hard and soft tissues of the oral cavity after providing whitening procedure in case of patients from different age groups.

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