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"Dental Bio Epoxy": filled polyepoxides for Out-Clinical Prophylaxis, Treatment, Closure, Conservation and Self-Restoration of Deep Carious and Traumatic Damages of Teeth

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ABSTRACT

For the first time, a method of extra-clinical self-liquidation and prevention of deep dental damage has been proposed. Practical dental restorations have confirmed previously put forward scientific assumptions:

1. About the ability of epoxy polymer to adhere strongly in an aggressive humid environment of the oral cavity and successfully withstand chewing and other loads for a long time (0.3-1 year, sometimes up to 2 years or more)

2. About the self-cleaning effect of epoxy resin and epoxy polymer on the bottom of the cavity of a carious, damaged or injured tooth.

3. As a consequence - about the possibility of successful dental closures and restorations without an expensive, dangerous and painful procedure of cleaning the bottom of the cavity with burs and etchants

4. About the non-traumatic nature (unlike traditional fillings) of the loss of epoxy fillings in case of unsuccessful installation or poor adhesion.

5. On the possibility of painless and multiple rein stallation of epoxy fillings and onlays in case of their loss.

Comparative characteristics of epoxy and acrylic (traditional) materials are given according to the main mechanical and resistance parameters.

Limitations and inconveniences of using epoxy composites are indicated. The theoretical assumptions (on the biocompatibility of epoxy with the ecosystem of the tooth and oral cavity; on the ability to use carious masses as a hardener; on the water resistance of semi-cured epoxy composites) and corresponding views on the possibility of creating self-installing epoxy dental fillings and self-restoration of affected teeth are presented. These assumptions are brilliantly confirmed in practice, using the example of an original, cheap and generally available epoxy material of cold curing with polyamines such as PEPA and DETA. Examples of successful self-restorations are shown and assumptions are made about the possibility of solving up to 75% of dental problems of patients of all categories in this way. Comparative characteristics of epoxy and acrylic (traditional) materials are given for the main mechanical and resistance parameters. The limitations and inconveniences of using epoxy composites are indicated. This method will be extremely necessary for the majority of the planet's population, and especially for the following groups.

Introduction

In the modern world, there is a revolutionary change and a change of technologies. This is especially true for biotechnological and biomedical areas, where fundamental changes have occurred in the last 50 years. New drugs, effective antiseptics, vaccines have appeared - which have removed previously ineradicable diseases (cough, cholera, gangrene) from the path of evolution. Many people are familiar with the feeling of frustration, unpleasantness or even horror when a sudden toothache begins or a tooth is chipped or a filling falls out. And even a minor change in the relief of the teeth often plunges a person into despondency. As a rule, these troubles with teeth happen at the most inopportune moment6 during illness, vacation and rest, on the road ... on days when the family dentist is absent ... or simply on days when there is no opportunity or money to go to a trustworthy dentist. As a result, there are problems with chewing loads and with food consumption in general. The feeling of helplessness and impending destruction of the dental ecosystem … expectation of an inevitable and unpredictable operation in the mouth All these troubles are familiar from childhood, from school - and haunt most people until death. And whoever the patient is, the relationship with his own teeth is often not improved (or is improved through intermediaries - doctors) and is comparable to the relationship with parasites (worms, fleas, etc.). That is why people often resort to radical (and unnecessary) measures to remove nerves or even replace teeth with implants or artificial jaws [1-5].

Then they start having new problems with implants and pins, but they are considered "normal" and "not scary". Is it possible to avoid all these troubles and reduce dependence on eternally busy, dissatisfied (because there are too many patients and they appear at the wrong time) and often greedy dentists? Dentistry still uses the developments and technologies of 50-100 years ago - the time when this science experienced a renaissance. Until today, it develops mainly by polishing old methods and improving the materials of 1960-1990 years. Therefore, it is generally accepted that the best way to care for teeth is to repeatedly brush them with commercially distributed toothpastes, and prophylactics are visits to the dentist every 3-6 months. Also, an indisputable truth is the need for surgery to eliminate caries in clinics, including by killing and even removing the affected or injured tooth. Such has led to the widespread development of dental clinics and points, of which there are probably no fewer than hairdressers or restaurants. Thanks to the efforts of medical and social advertising, dental services have gradually moved from purely medical to the sphere of medical and everyday services, and are more or less on par with manicures, haircuts, massage or tattoos. However, no propaganda of the inevitability of visits to dentists or the transfer of dentistry to the service sector, does not eliminate the real situation. Namely, that dentistry is a purely medical, and operative (involving a real operation) service, often with anesthesia and complications, as well as inevitable physical and psychological suffering. Even in ancient times, people tried to master self-prevention of dental diseases.

There is information about the techniques of yogis for cleaning teeth with herbs and processing with natural resins. The inventor of the microscope A. Leeuwenhoek cleaned his teeth with salt (possibly mixed with natural powders), and obviously achieved some success. There are many pieces of advice from long-livers to chew = plant resin =, coniferous fragments (branches, cones, crowns). It is traditionally believed that even a small carious cavity has no chance not only of self-healing, but also of self-sealing outside a dental office and qualified supervision. Regarding medium-sized lesions, risks and skepticism increase, and for deep lesions such self-medication seems dangerous and even as a crime against the health. In fact, everything is not so scary and hopeless. On the contrary, today's dental polymers (mostly acrylic in nature, with bio-impact synthetic hardeners) cannot be considered an ideal final option for the development of dental science. For example, their degree of curing (especially for photopolymers) does not always exceed 80%.. The main barrier to their future is the need to thoroughly clean the tooth surface, dry the surface, use primers, and... high hardness (something that is an advantage for them). Indeed, when treating deep carious or traumatic lesions, the restored tooth faces additional problems that are not noticeable when treating small and even medium-sized cavities. These are different coefficients of thermal expansion, and different reactions to pressure changes during chewing and rinsing processes (Figures 1-4).

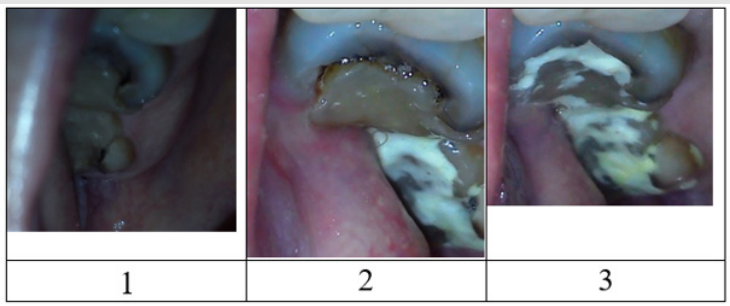

Figure 1: (our work [8]) View of the self-restoration site - teeth 7 and 8 are half-destroyed (installed 4.2023 - fell out 6.2024): 1 - before installation; 2 - after epoxidation of tooth 8; 3 after additional epoxidation of the adjacent tooth 7.

Figure 2: View of the self-restoration site in 5 right molar – before (left) and after epoxy-filling. Epoxy-composite worked during1 year, after that fell out without destruction of molar.

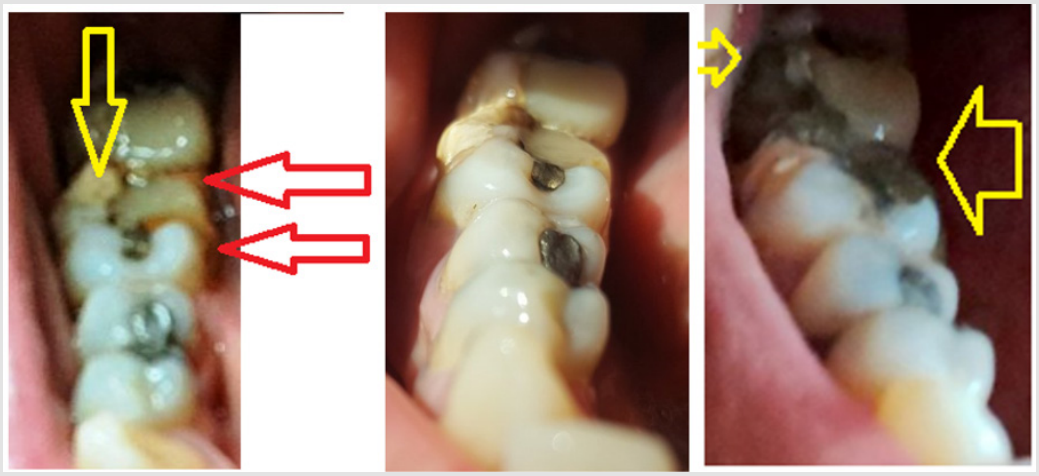

Figure 3: Epoxy inlay (yellow arrow) and reinforcement-bookmarks (around a 15-year-old conventional filling) in a cracked 6th lower tooth of a 50-year-old patient. In the middle of the teeth, amalgam fillings from a 35-year-old filling are visible.

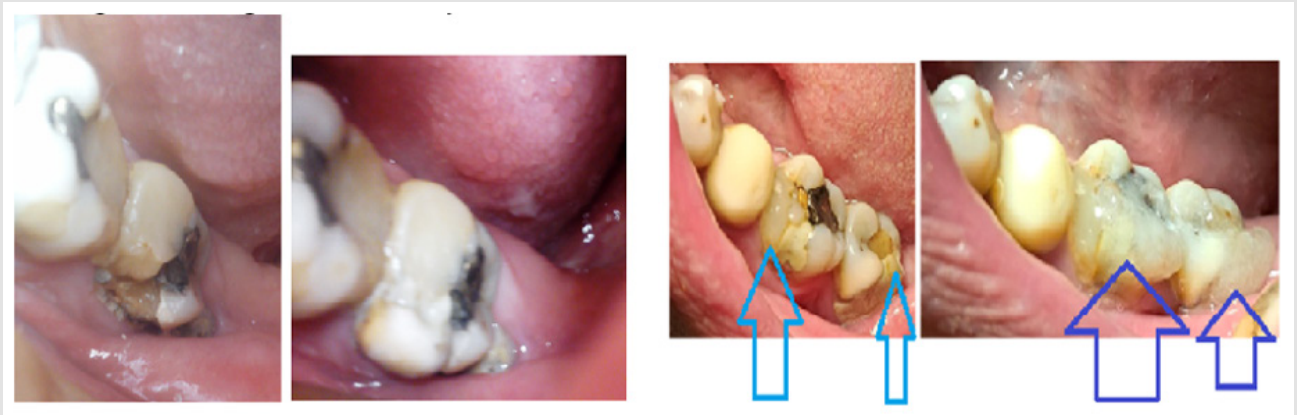

Figure 4:

A. Lower teeth 6 and 7 before epoxy restoration of tooth 7 (left) and after (right).

B. The same after a year. Lower tooth 6 (with a metal filling) and 7 (with a metal filling that had already fallen out) before and after the 1st (left light blue arrows) and 2nd (right blue arrows) epoxy restoration. The epoxy composites have not fallen out to this day.

The stability of polyacrylate dentures and fillings is very high, and their guaranteed service life is usually comparable to the patient's lifespan. During operation in the mouth, polyacrylate materials practically do not elasticize and do not swell. But this inflexibility of polyacrylates sometimes does bad service to the tooth. Thus, along the contact line, the adhesive interphase gradually separates and liquids penetrate there. This gradually increases the sensitivity of the tooth to the loads. Micro displacements in the contact area lead to gradual pushing of the adhesive area by the filling, microtraumas along the dentin/enamel, and finally to cracks in the contact area. At the same time, the filling itself often remains quite strong (although not always). At the beginning of the 20th century, Russian chemists Dianin and Prilezhaev discovered synthetic Epoxy Dian resin, and in 1930-40 German firms begun to produce first industrial epoxy-materials. However, it was included in the category of biohazardous reagents, and until recent years, questions about its use in Endo therapy were not raised. At the end of the 20th century, however, the taboo on the use of epoxies in bio sensitive areas began to be lifted and forgotten. Epoxy tables, coatings, furniture varnishes, fiberglass panels and structures for the food, medical, and sports industries appeared. Finally, in the 21st century, it turned out that polyep oxides can act as endoprostheses. However, before using them in dental practice, apparently no one guessed. And this is a shame, since humanity lost decades before we discovered the possibility of significantly simplifying dental self-repair.

Experimental Estimates

Due to the laboratory scale of the work (as well as the mobility of the patient carriers of the experiment), it is still difficult to make a complete statistically reliable coverage of the experimental results on deep filling and tracking the dynamics of the tooth-polymer system. But Table 1 informatively highlights the first results (Table 2). Figure 5 shows a typical case of fairly successful self-restoration of a completely destroyed corner tooth. The filling on it stood for 20 years, in the process of strengthening it, dentists wore away the dentin almost to the nerve. During this entire time, the tooth demonstrated constant sensitivity, but thanks to caution and constant prophylaxis, the tooth functioned almost normally. But in 2022, the tooth began to deteriorate, due to an obvious weakening of the contact of the filling with the tooth. Since 2023, fragments of the upper enamel, and then dentin, began to fall off from the base filling. At this stage, self-strengthening of the base filling was carried out with an epoxy composition, and this operation was carried out several times. But after 2 months, this overlay fell off along with another fragment of enamel. A second self-filling was performed, but it did not stop the "wandering" of the base filling, which led not only to increased sensitivity, but also to noticeable (according to the patient) displacement of the filling in the tooth. Finally, in the summer of 2024, the base filling and the remains of the tooth fell out, down to the gum level (only a thin ledge of enamel remained). At this stage, three self-fillings (Figure 5A) were performed, and all three epoxy "mega-fillings" (one and a half teeth in size) were adhered both to the surface after destruction and to the lateral surfaces of adjacent teeth [6-10].

Table 1: Test results for deep self-sealing, observed for 6 months.

Total	More 3 monts	Less 3 monts	Less 7 days
12	7	3	2

Table 2: Estimated mechanical and resistance parameters of epoxy dental seals.

	Normal conditions	In wet\aqua
Compression, MPa	100	40
Adhesion to steel, kgf	400+-200	100+-50
Adhesion to dental enamel, kgf	200+-100	50+-20
Water-absorption, %\month	3+-1	10+-5

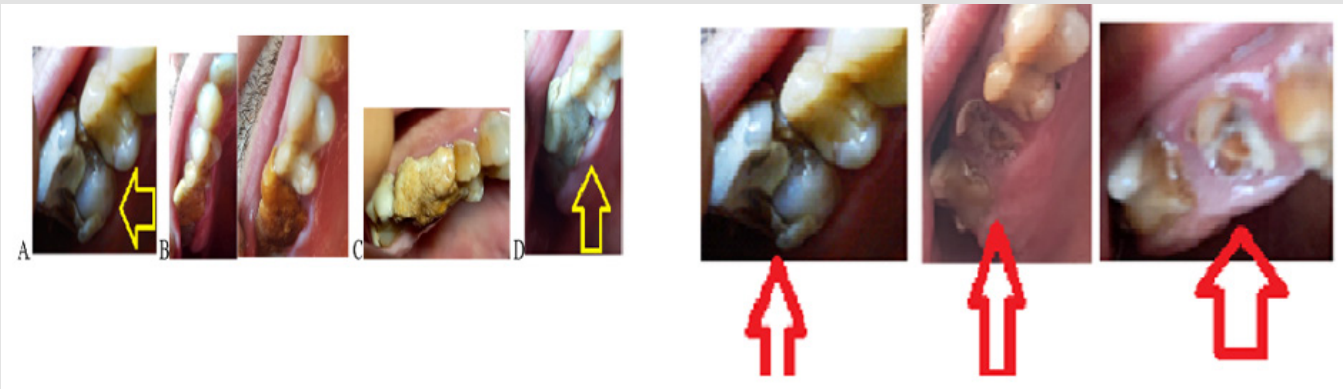

Figure 5:

A. Example of tooth 6 on the eve of decay (A), 1st epoxy filling (B, 1st and 3rd months), 2nd (C), 3rd (D) epoxy filling. Epoxy-compaund in site of fully destroyed 6-th tooth.

B. View of the restoration site. Left - before tooth destruction (white epoxy filling is visible over a 30-year-old destructive filling). In the center - immediately after destruction. Right - after three replacements of onlays-bridges (the fourth is still in place today).

Each of these fillings did not last long, but long enough for study (1-2 months). Each time after self-falling out, prophylaxis was carried out using conventional non-clinical methods - rinsing and toothbrushing. Each time, the studied area near the tooth (as well as the fallen filling) was cleaner than the previous one - it contained fewer putrefactive and inflammatory fragments. Each time, sensitivity, pulsation and pain in the area of the affected tooth decreased - with the third self-installation, all unpleasant sensations disappeared. The 4th time, the installed filling-bridge was self-installed more successfully, and it has been working for more than 3 months. At the same time, the dental nerve preserved without removal returned to normal, for the first time after 20 years of high sensitivity. This speaks not only of the optimal coating of all areas of leakage and inflammation with the epoxy compound, but also of the healing (or cleansing) effect of the epoxy compound. It is proved by visual analysis – that demonsrate Figure 5B. It is quite reasonable to ask about the durability of such fillings and onlays. Indeed, the lack of serious surface preparation and qualified medical care in most cases leads to a more rapid loss of these inlays. At first, we thought that there could be no question of comparing the lifetime of these types of fillings with medically installed and approved traditional methods. But it turned out that the percentage of failed self-attitudes (that is, those that fell out immediately or caused problems) is not so significant - about 20%. In other cases, self-installed inlays and overlays can stand for a time quite comparable to traditional ones - from 2 months to 2 years. At the same time, roni (as it turned out) do not cause inflammation and carious-putrefactive recurrences under the filling or during contact (Figures 6 & 7).

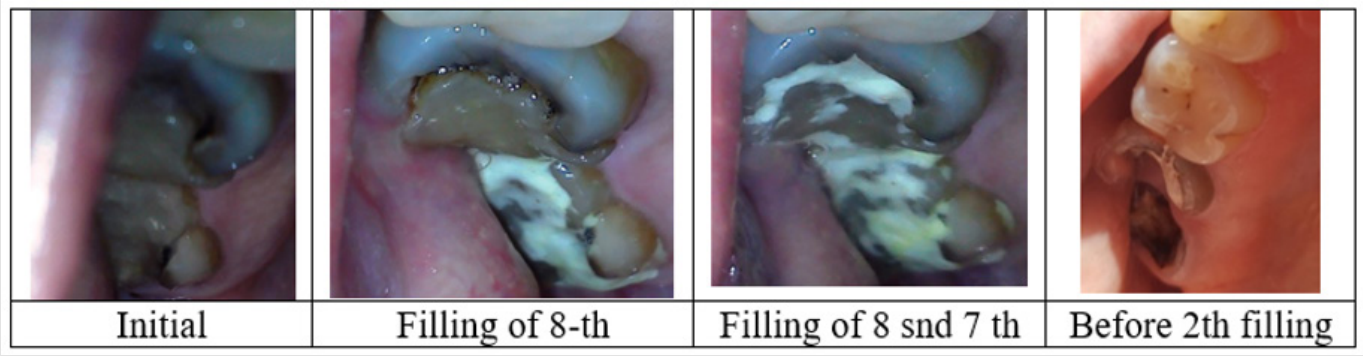

Figure 6: The destructed fragments of 7 and 8 teeth, and his treatment.

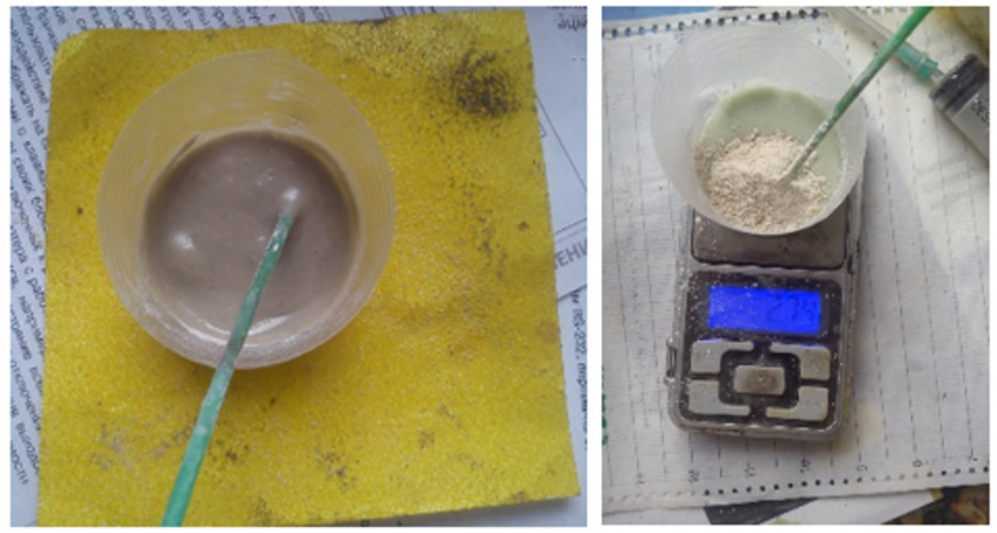

Figure 7: Example of method of non-clinical self-restauration. Self-restoration does not require special equipment and skills. It can be done in any conditions and by any person (Figure 7).

On the contrary, the prolapsed composites leave behind a cleaner place than the installation floor, and without signs of secondary carious-putrefactive processes (Figure 5). This perfectly confirms our assumption that epoxides self-cure by the compogent of putrefactive layers and masses from the surface of the tooth-epoxy contact. The process of "cleaning" the surface with an epoxy filling can be compared to the effect of tape on a dusty fabric; The more often the tape is peeled off, the more outer layers are removed and the cleaner the surface Quite reasonably, the question arises about the durability of such fillings and onlays (Figure 8). Indeed, the lack of serious surface preparation and qualified medical care in most cases leads to a faster loss of these inlays. At first, we thought that there could be no talk of comparing the lifespan of these types of fillings with medically installed and approved traditional methods. But it turned out that the percentage of failed self-installations (that is, those that fell out immediately or caused problems) is not so significant - about 20%. In other cases, self-installed inlays and onlays can stand for a time quite comparable to traditional ones - from 2 months to 2 years. At the same time, they (as it shown) do not cause inflammation and carious-putrefactive relapses under the filling or in the place of contact. On the contrary, fallen composites leave behind a cleaner place than before installation, and without signs of secondary carious-putrefactive processes (Figure 5). This perfectly confirms our assumption – epoxies self-curing components of putrefactive layers and masses from the tooth-epoxy contact surface. The process of "cleaning" the surface with an epoxy filling can be compared to the action of scotch tape on dusty fabric; the more often the tape is peeled off, the more outer layers are removed and the cleaner the surface. Considering the self-cleaning action of epoxies (even if the filling falls out immediately) and the ability to independently (painlessly and quickly) re-fill the cavity an infinite number of times, it is easy to understand the importance of this invention both for closing cavities and for their prevention. As a result, it turns out that the painful processes of drilling a tooth and etching it with acids before filling can be replaced by a simple alternation of self-inserted fillings, even without elementary surface preparation.

Figure 8: Fragments of really worked epoxy-inlays.

Possibility of Self-Installation of "Bridges" and Protective Pads

We often have a problem with weak teeth (wobbly, sensitive, chipped or micro-cracked, worn out), which it is desirable to protect. Traditional dentistry does not always deal with such procedures, or offers expensive or painful ones (enamel extension, braces, etc.). Epoxy compositions allow self-installation of sometimes weak (short-lived or worn down) but free and easily rein stallable pads. They can be glued both to the tooth itself and to adjacent stronger teeth. Accordingly, it becomes possible to easily install epoxy "bridges" for completely destroyed teeth that have relatively strong (not loose) neighbors. The epoxy composition, spreading over the dental cavity, captures all possible areas for penetration, as a result of which adjacent teeth (especially if they are weak) are also strengthened (Figure 9). Of course, such pads are not as durable as pins and implants. But they do not require expensive procedures for installation and subsequent correction (the composition itself forms the desired bite with slow hardening), prevention and reinstallation in the future. Also, the psychological aspect is very important (as a rule, it is not taken into account at all). Everyone knows what suffering toothache or discomfort causes, and perhaps no less anxiety is caused by the threat of an inevitable visit to the dentist. People have experienced similar discomfort and In our case, a mental patient does not depend on the qualifications of his doctors, their mood and employment, as well as on the costs (and significant) of time and money.

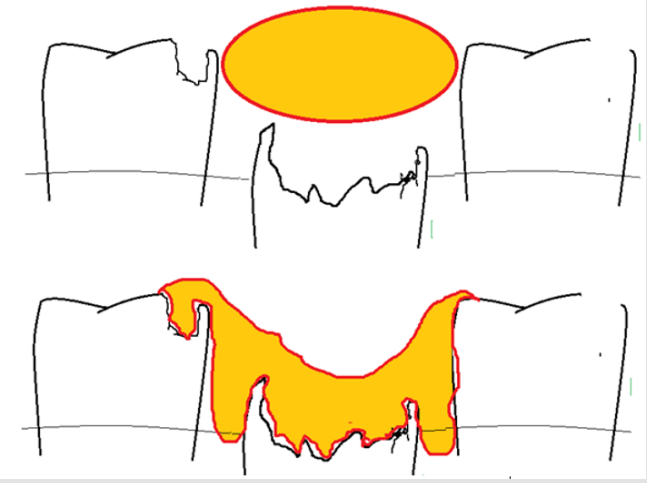

Figure 9: An example of self-installation of a deep filling-bridge (in the center). On lays on the outer teeth.

Assessing Prospects

It is obvious that the adhesion and mechanical parameters of self-installed fillings will be noticeably lower than those installed normally, under the right conditions, by a qualified doctor. There is no need to even look for scientific explanations here, but we will indicate some obvious reasons.

1. Lack of serious cleaning or preparation of the contact surface. This immediately reduces adhesion and increases the risk of loss. However, this drawback in this case is not fatal, since the replacement filling can be reinstalled immediately, in the coming days and independently.

2. Incompleteness of the compositions for self-installation. This drawback will be solved if this scientific direction is actively studied by specialized scientists and dental practitioners.

3. Comparative softness of polyepoxides and their ability to gradually swell in warm aqueous solutions.

4. Inertia of world medicine, disinterest of dentistry business and increased sensitivity of medical practic to the problems of sepsis, insensitivity and isolated negative cases.

This will slow down the implementation of new technologies in much the same way as the complete transition of gasoline vehicles to electric power has been slowed down in the years. From Figure 10 it is clear how destructive even a small intervention of a drill can be in an attempt to restore the eco-balance of a tooth. When two unfavorable factors combine – chipping of part of the tooth before filling and secondary processes – a serious cavity develops. Repeated treatment may result in the loss of most of the outer body of the tooth. After which, doctors usually either send for removal of the nerve with the installation of crowns or removal of the entire tooth. This is not at all what a patient dreams of when he comes to the dentist and leaves there his time, money (sometimes considerable) and peace of mind for the next few days (and sometimes the next months and years). It's good if the dentist is a person with a conscience and does not seek to enrich himself or assert himself (for example, by transferring him to his student for treatment) on the patient's problem. But even the best and most error-free doctor is unlikely to go beyond the diagrams shown in Figure 11 Medical immunity (more precisely, impunity), the lack of doctors and their solidarity (if the patient sues one of them) will allow him to avoid any problems in the event of an unsuccessful operation. In our situation, the patient simply stirs the epoxy compound, waits several hours until it half-hardens and presses it into the cavity. The degree of preliminary surface cleaning is up to the patient himself. You don't have to clean it at all - but then the likelihood of unsuccessful installation and rapid loss is greater (since food debris can interfere with epoxy-tooth contact). You can brush and rinse the area being installed with a toothbrush during the day, and do not eat anything else before installation. Everyone can develop for themselves rules for self-installation and reinstallation of such seals.

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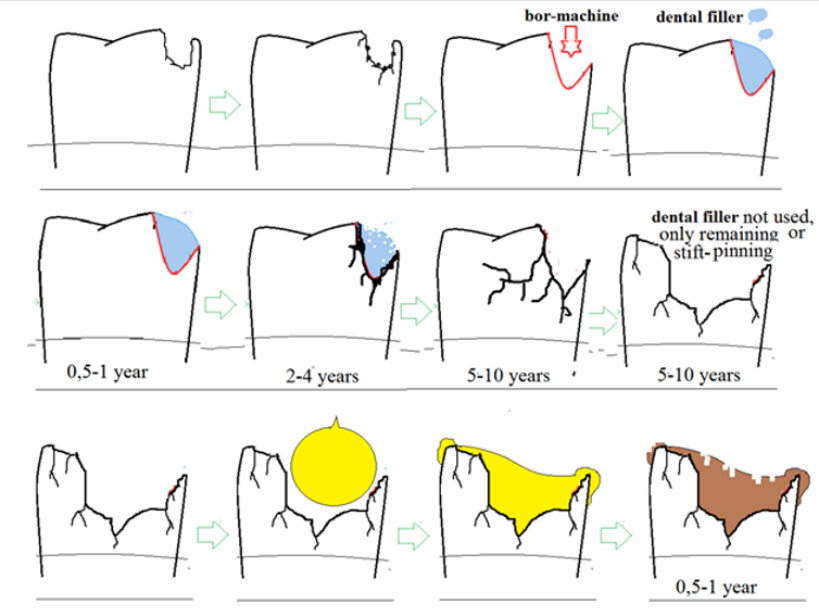

Figure 10: Visualization of the process of development of a deep carious cavity (including due to medical interventions with a drill machine). The first and middle rows are traditional medicine, the third row is self-restoration of the resulting cavity.

Figure 11.

First Results and Reviews

It would be wrong to leave aside the reviews of volunteers who agreed to try this new method. We do not yet have the right to publish personal reviews. But we can give a general description of these reviews and assessments. Let us stipulate right away that almost all patients were not initially optimistic, and most agreed to try epoxy-dental materials due to a hopeless situation. As a rule, these situations have already been described above. We can divide them into the following groups

1. There was no money for dental repairs, and there were no prospects for allocating it in the future. This group usually consisted of low-income or too frugal patients. They reluctantly agreed to experiments on themselves, recognizing the free nature of the method as the only advantage.

2. Innate or previously acquired fear of dentists and other operative doctors. These patients immediately or later (in the naive hope that "the tooth will heal itself", but for some reason it did not), but also reluctantly, agreed to the experiment.

3. Very busy people who do not have their own time. Most often, these are wealthier and even more successful people who simply do not have the opportunity to spend time visiting the dentist. Or people who are afraid of losing time after the dentist

(for example, if a tooth hurts after a filling operation). This is the most valuable and at the same time the most dangerous group - since in case of success, these people had all the connections and means to advertise the method. And vice versa, in case of failure, they could easily create an anti-image.

4. Supporters of non-medical methods. This is a diverse category (poor, rich, successful, losers), who easily grabbed our offer, since they had recently turned their bodies into a testing ground

5. Scientists in related fields - medicine, materials science, physiology, etc.

6. People with problems with documents and civil status - refugees, convicted, homeless, unemployed, hiding from payments, etc. Such people, for various reasons, avoid visiting places with the possibility of official registration or control (clinics, hospitals, hotels).

7. Children whose baby teeth are living out their last month or years. Most often, this audience also turns out to be afraid of doctors or busy (children or parents).

8. People with regular movement (geologists, travelers, tourists, refugees, military), who do not always have time to find or wait for quality dental services.

9. People living where there are no dentists or they do not have authority.

10. Those who are limited even in small movements - disabled people, the elderly, people with a home regime.

11. Other categories of the population.

Conclusions

1. The next hypothesis are proposed:

A) biocompatibility of epoxy with the ecosystem of the tooth and oral cavity;

B) ability to use carious masses as a hardener;

C) about the water resistance of semi-cured epoxy compositions. Based on their hypothesis the idea on possibility of creating self-installing epoxy dental fillings\inlays and self-restoration of carious or affected teeth is presented.

2. The theoreical assumptions have been well confirmed in practice, using the example of an ordinary, cheap and widely available cold-curing epoxy material using polyamines such as PEPA and DETA.

3. Epoxy fillings, dentures and inserts still significantly swell and elasticize (and accordingly lose their initial strength) during operation in the oral cavity. Therefore, their service life is an order of magnitude lower than new acrylic dental materials. But the loss of their properties only leads to their loss, and does not destroy the tooth tissues themselves (even if they are weakened). It has also been revealed that secondary carious processes rarely occur under epoxy fillings, even if the adhesive contact is broken. This may be a consequence of the inclusion of carious masses on the surface of the damaged tooth in the epoxy curing process - which is not found in any non-epoxy filling system (acrylic, amalgam, polymer-cement). Moreover, a fallen epoxy insert can be easily replaced at any time (even on the day it falls out) independently. First experiments show that epoxy materials have a cleaning effect on the bottom of a damaged cavity - even if no surface cleaning has been carried out.

4. Examples of successful self-restorations are shown and assumptions are made about the possibility of eliminating up to 75% of the dental problems of patients of all categories in this way.

References

1. D Starokadomsky, N Shklovskaya, V Makeev (1995) Polymer filled compositions for dentistry. News of Dentistry (Новости Стоматологии) 1: 40-45.
2. D L Starokadomsky (2004) Influence of highly dispersed pyrogenic silicas on the processes of photopolymerization of oligoetheracrylates and properties of the obtained dental composites. Dissert. for Ph D Chem Sci (Kyiv: Chuyko Institute for Surface Chemistry, pp. 200.
3. D L Starokadomsky, M N Reshetnyk (2022) Possibilities of Compositions "Epoxy Resin-Nano. Silica-Water-Binding Fillers" for Out-of Clinical Prevention and Selt-Treatment of Carious and Traumatic Lesions of Teeth. Biomedical J Scientific & Technical Research 44(1): 35224-35228.
4. Vouvoudi E C (2022) Overviews on the Progress of Flowable Dental Polymeric Composites: Their Composition, Polymerization Process, Flowability and Radiopacity Aspects. Polymers 14(19): 4182.
5. T Tauboeck, H Oberlin, W Buchalla, M Roos, T Attin, et al. (2011) Comparing the effectiveness of self-curing and light curing in polymerization of dual-cured core buildup materials. J Am Dent Assoc 142(8): 950-956.
6. Dm Starokadomsky, Mr Reshetnyk, Nd Starokadomska (2023) Epoxy Compositions as a Material for Effective Self-Restoration of Carious and Traumatic Damage to Teeth and Strengthening of Old Fillings. First Experience. Biomed J Sci & Tech Res 53(2).
7. D Starokadomsky, M Reshetnyk (2022) Compositions "Nanosilica – Mineral Fillers – Epoxy Resin" For Out-Clinical Dental Prevention and Self-Treatment of Carious and Traumatic Dental Damages. Middle East Res J Dent 2(1): 1-3.
8. D Starokadomsky, M Reshetnyk (2022) Water-Polymerisable Compositions "Epoxy Resin - Nanosilica – Mineral Fillers" for Out-Clinical Dental Prevention, and Self-Treatment of Carious and Traumatic Dental Damages. Intern J of Health and Med Res 1(5): 69-73.
9. D Starokadomsky, M Reshetnyk, V Antipova (2021) Possibilities of compositions "pyrogenic nanosilica + nano-Al2O3 + plant/herbal dispersions" for prophylaxis, selfrestoration and delay in the development of carious & near-dental pathologies (2021) Journal of Research in Environmental and Earth Sciences 7(10): 07-15.
10. M Gutiérreza, E Sutila, P Malaquiasa, T de ParisMatosa, L de Souzaa, et al. (2017) Effect of self-curing activators and curing protocolson adhesive properties of universal adhesivesbonded to dual-cured composites. Dental Materials 3(3): 775-787.

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