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Polyepoxy Compositions as an Effective Material for Extra-Clinical Self-Installation of Large Fillings and Dental Bridges in Case of Complete Destruction of Lateral Teeth

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ABSTRACT

The relevance and possibility of preventative and self-restorative epoxy composite methods in dentistry is substantiated. An assumption has been made about the possible chemical interaction of polymerizing epoxide with carious masses, with their neutralization in the polymer structure. The feasibility of self-installation of epoxy composite materials as prosthetics and fillings for deep carious lesions and decayed teeth has been experimentally proven. The effect is achieved, thanks to the use of compositions with nano-silica and micro-sized biocompatible mineral fillers. *In-vivo* practical installations demonstrate their high efficacy (over 90% success rate). The physical, mechanical and resistance parameters of epoxy compositions cured in dry and wet (or underwater) conditions are indicated. Practical examples of fillings and restorations of real teeth are presented. It has been shown that the use of these compositions (subject to curing technology) provides highly effective dental fillings, with a minimal percentage of unsuccessful cases and the absence of post-effects. The findings confirm the potential for effective prevention and self-healing of dental systems through non-surgical application of specialized dental powders, pastes, and rinses (subject to proper dental hygiene). The results confirm the possibility of effective prevention and self-healing of dental systems through non-operative dental exposure of epoxy owerlays. The proposed method of using ordinary, commonly available epoxy resins allows us to open a new direction in dentistry - self-dental methods. This is very important for the majority of the world's population.

Keywords: Dental Diseases; Traditional Dentistry; Surface Preparation Problems; Self-Restoring Prophylactic Compositions; Self-Restoration Possibilities; Positive Effects; Highly Filled Epoxy Composites; Self-Filling

Introduction

Military operations in Central Europe (in Ukraine and Russia) have demonstrated the need for rapid dental care in extreme conditions. These are often not just non-clinical, but conditions generally unsuitable for surgery and medical restoration-fields, frontlines, train stations, streets, or disasters (fires, landslides, shelling, floods). These include everyday non-clinical conditions, which are also often unsuitable for medical interventions-for example, in the workplace, under time pressure, or in unsanitary and technical facilities. Often, both poor and wealthy individuals face a simple lack of time to visit a clinic (for example, they work until the evening every day without the right to leave), or are overloaded with housework, are far from clinics, etc. In these cases, dental lesions can develop over years without proper care, leading to complete decay. Often, a patient is forced to pay attention only when a tooth (or rather, its external, non-root part) has completely decayed. This can also be a consequence of loosening old fillings (especially those 10-20 years old), which are often

harder than dentin and can chip the tooth from the inside for years, causing regular pain. Unfortunately, nature has not created a proper mechanism for the ingrowth of loose, non-contact fillings (similar to the ingrowth of foreign objects into bone, muscle, or skin). As a result, old fillings not only cause discomfort but also fall out, dislodging all the dental material at the site of former contact. The remaining tooth is incapable of self-healing-another mistake of nature, which has not endowed humans with the dental self-regeneration of a crocodile or rodents. Perhaps this was how nature carried out natural selection - since unhealthy people lost their teeth faster - after which they could not eat normally and died faster (giving way to stronger individuals).

Attempts to combat tooth decay using resinous sealants have apparently been around since the time of the Neanderthals (Barras [1]). Many of these were certainly relatively successful - for example, they preserved decay or chips or closed the affected area for 2-3 months. Considering that ancient humans lived only 10-15 years after replacing their baby teeth with permanent ones, this was a good result. Such experiments may have been conducted in the Middle Ages, but only fragmentary information is known. For example, the discoverer of microbes, A. Leeuwenhoek, monitored teeth by brushing them with salt and examined lost teeth under a microscope (and possibly tried to reinsert them) - and discovered the presence of bacteria. Apparently, coniferous resin sealants were also known, which allowed them to last for some time, but there are apparently no scientific studies on this. In the Western world and Latin America, the installation of bridge-like and other deep restorations has long been considered the prerogative of highly qualified medical professionals. In recent years, the use of self-aligning polymer fixatives has been permitted only for removable dentures (Korega brand compounds and similar products [2]). In Eastern and Asian countries (Pakistan et al, [3-6]), this practice is also successfully practiced by street specialists, who now actively use readily available adhesives and plastics (polypropylene, acrylates, and rubbers). In any case, the scientific research side of non-clinical restorations is still largely undeveloped, and our work can be considered a first attempt. There are many theoretical arguments for epoxidation of damaged areas of the dentition, both pros and cons. Before experiments (which were sometimes successful) on model and living (in vivo) subjects, there were many compelling arguments against this “epoxy intervention” in the oral cavity without traditional sanitary and surgical preparation (nerve removal, dental drilling, medication application, air cleaning, and etching). Epoxy resin does not like moisture during the curing process, easily becoming soggy and not curing. The hardener and resin are toxic. Possible side effects include sepsis, tooth chipping, and the entry of reaction products into the esophagus. Allergies and side effects are also possible. No one has yet attempted to cure epoxy resins directly in the mouth of a living person. No one has yet attempted to cure epoxy directly in a living person’s mouth. There are sufficient reports on the use of polymers in dentistry [7-11]. But there’s wery little information in the scientific literature on the use of polyepoxides in dentistry, surgery or endoprosthetics. When such articles appear, they can be episodic or even negatively comical (such as Hemandas, et al. [12]). Of the existing ones, we can only refer to our earlier works [13-17].

Experimental

Thus, the scientific and medical fields, as well as the general public, are wary of such ideas. However, experience shows that epoxy inserts (with proper curing and use) are easily incorporated and perform well in any conditions (Table 1). Table 1 shows that the physical and mechanical properties of polyepoxy materials are comparable to or better than those of acrylic or natural materials. These data also indicate that epoxies can successfully function in the oral cavity, withstanding any reasonable loads in a humid environment. Indeed, Table 2 shows that the overwhelming majority of successful restorations using this method are successful, even taking into account the fact that many were carried out in unsuitable conditions. Can see (Figure 1) that self-restored compositions can compose from accessible and inexpensive materials. The colour of obtained composites can differ from transparent to gray and dark tones. Figures 2 & 3 show that the epoxy method not only saves the patient time and money, but also allows for maximum tooth preservation. Of course, such a restoration will only provide temporary relief for people with weakened immune systems-theoretically, recurrence of inflammation under the filling is highly likely.

Table 1: Comparison of the strength and durability of epoxy composites in their original form and after exposure to a warm aqueous environment. *-Estimated data.

Epoxy polymer	in dry normal cond.	in H_2O
Compression, MPa	100 +-20	50+-10
Bending, MPa	10 +-2	6+-2
Adhesion to dentine, rel.un.	100%	80%
Adhesion to enamel, rel.un.	100%	35%
Microhardness, XF	80	40
Wear resistance, rel.un.	100%	50%
Water resist, (swelling), 30 °C, % \ 3 monts	3%	10%
Bone\dentin		
Compression, MPa	20+-3	20+-3
Bending, MPa	15+-5	15+-5
Microhardness, XF	50	40
Wear resistance, rel.un.	80%	70%
Acrylates		
Compression, MPa	150+-20	-
Microhardness, XF	90	-
Wear resistance, rel.un.	100%	-

Table 2: Statistics of restorations performed (on the teeth of three patients) of partially destroyed teeth.

All	Less 1 month	1-3 months	3-12 months	>1 year	Post-Inflammations
15	2	5	4	3	1

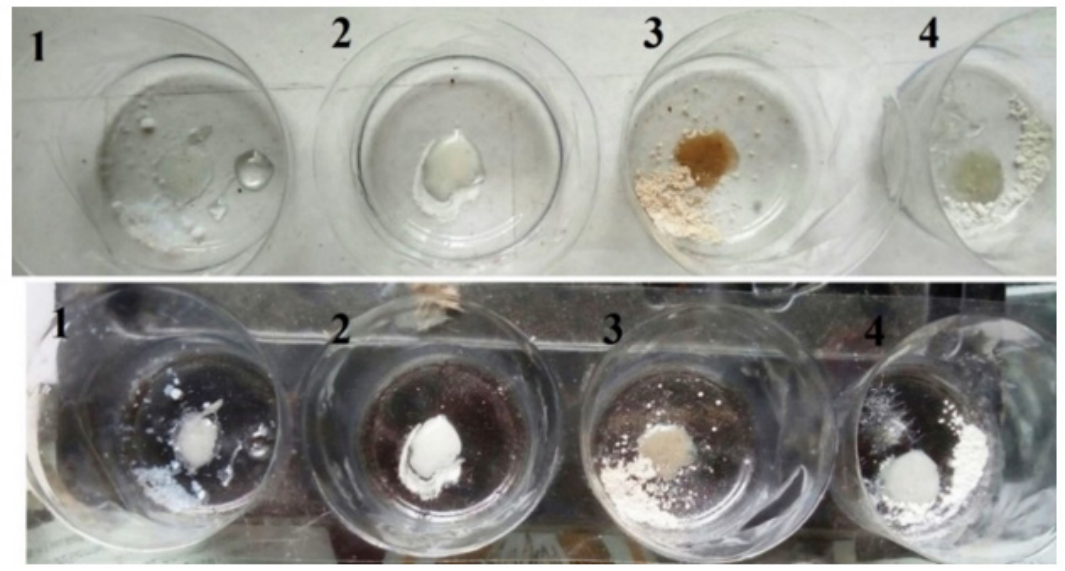

Figure 1: Type of epoxy composites available for dental restorations. Left-to right – compositions and their fillers:

1. Epoxy+SiO_2 and Neat epoxy;
2. Epoxy + dentifrice or TiO_2;
3. Epoxy + Gypsum;
4. Epoxy + White Cement.

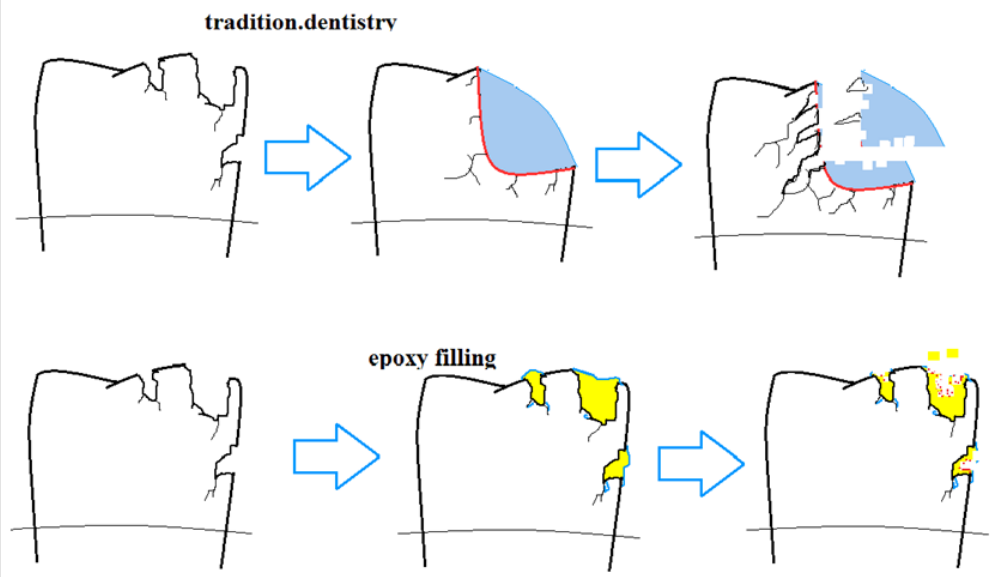

Figure 2: Restoration and its subsequent aging/destruction with traditional and epoxy execution

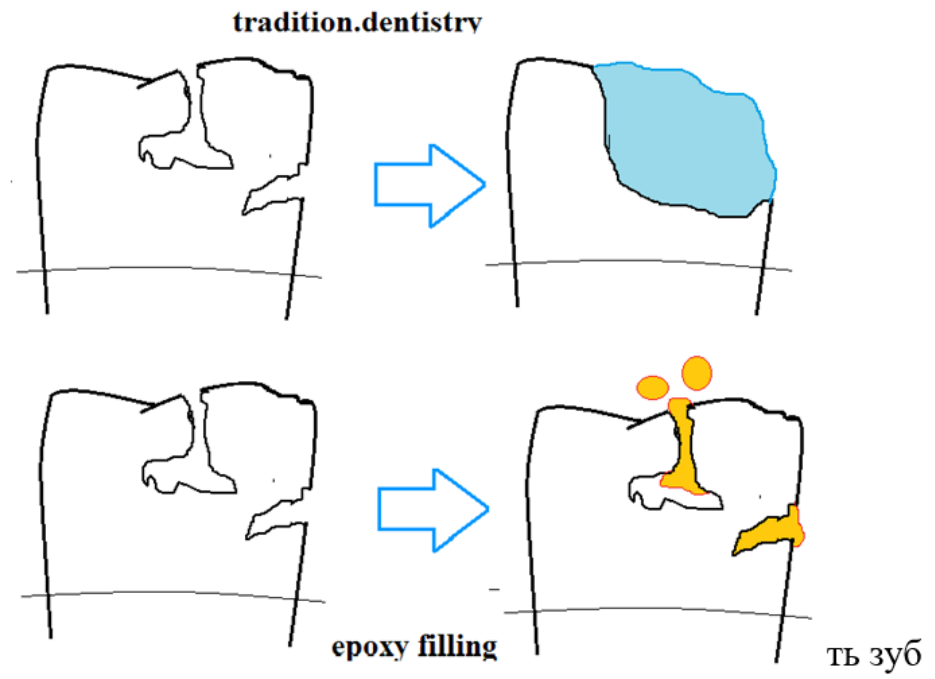

Figure 3: Comparison of traditional and epoxy fillings.

However, we would like to make a few caveats here:

1. Dental immunity in most people is strong, and its capabilities are poorly understood and rarely utilized. It is primarily effective in regions with limited dental service, but this does not apply to megacities (where the majority of the world's population lives). Dentists know that in many cases, simply covering the decayed area for a long time is sufficient, and the teeth themselves will find a way to normalize the environment in the affected area.

2. The damage caused by grinding down dental tissue with a dental drill, followed by cleaning (air blasting, primer application), and "picking" by the hands of dentists (even the best) causes enormous stress to even the healthiest tooth and the strongest person. This procedure alone (and it's a real procedure, not a pastime like a pedicure, piercing, or haircut, as advertised) can weaken the tooth and cause recurrence.

3. During curing, epoxy resin must react with the most active, putrefactive, part of the carious mass, using it as a hardener and incorporating it into the polymer. Neither cements, acrylates, nor other dental materials produce this effect.

Figure 4 shows a typical case of such a restoration. Due to decay of the 6th tooth in the area of contact with an old (20-year-old) filling, half of its upper part has chipped off. Long-standing caries also affected the adjacent tooth. Several self-restorations were performed, which worked successfully for several years (1 and 2). In 2026, they fell out simultaneously (during a food spill), preceded by intermittent pain and micro-movement of the fillings (fixed by the patient's tongue). Along with them, the deep old filling, which had caused the decay, fell out. Following the technique, the patient prepared and installed a new one-piece epoxy denture himself on the same day. A typical case is shown in Figures 4 & 5 which describe the complete loss of the patient's tooth No. 6 and partial loss of the tooth No. 7. Prior to the loss, the patient complained of periodic dull pain (including at night), characteristic of the mobility of old fillings that had lost contact and were delocalizing. The socket of tooth No. 6 was left with nothing but an exposed root remnant with sensitive living tissue. The patient was encouraged to try the epoxy-technique himself, eliminating the painful and time-consuming (and costly) traditional preparation steps-applying a medicated compress; nerve removal; root canal cleaning; etching; strength testing of Dentin bottom, etc. The installation process was simplified and was performed without lighting (an iPhone flashlight), heat, or water (antiseptic and cotton wool were used). After 20 days, another small epoxy filling was added to the existing epoxy onlay in the adjacent tooth No7 (also partially decayed) with signs of deep caries (Figure 6). It was placed in domestic and almost unsanitary conditions (in a utility room) using a sterilized screwdriver (instead of a spatula), a DVD instead of a glass slide, and clean wipes. This filling also performed well and remained working undesroyed until the test removal of both fillings (Figure 6).

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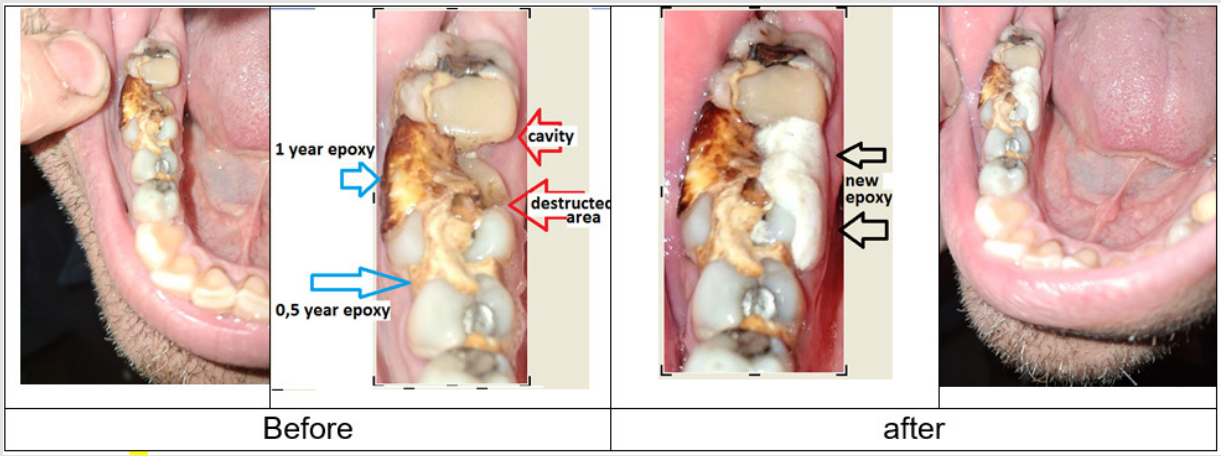

Figure 4: An example of successful restoration of destroyed areas of the lateral teeth of a 50-year-old patient.

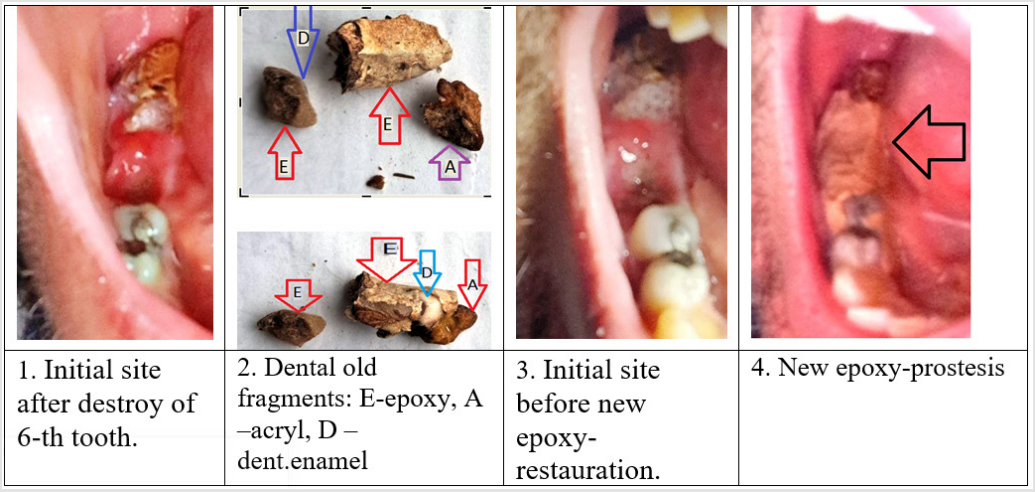

Figure 5: Fresh (1 hour ago) collapse of a complex of old (acrylic) and new (epoxy) fillings with the remains of a tooth, and the view after self-installation of an epoxy prosthesis.

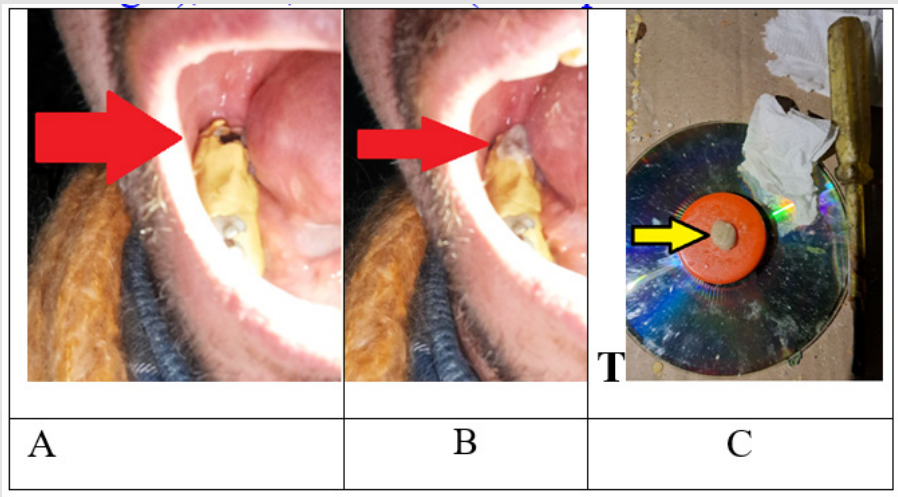

Figure 6: Site of secondary restoration and additional inlay after 20 days.

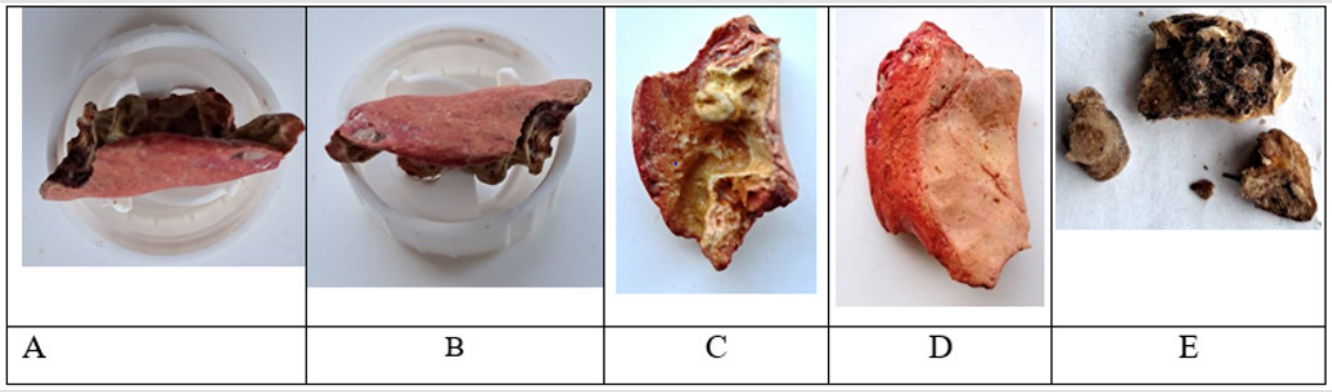

Figure 7: View of the denture from different angles after one month of use and removal (the red background is due to the color of the alcohol-based rinse solution - red wine). E - the inner surface of old fallen fillings.

Recommendations

The steps for fasted self-procedure are next:

1. The affected area was rinsed with a water and alcohol solution (wine), then gently brushed with a soft toothbrush (no pain was felt).
2. A tissue swab was inserted into the affected area, then removed and another one inserted. A clean, thin towel can be used, covering both sides.
3. The finger (which will be used to insert the epoxy composite) is lubricated with sunflower oil, and the opposite row of teeth is also lubricated (to prevent the composite from sticking after pressing).
4. The composite ellipsoid (resin + hardener, and optionally filler) should remain tacky after being pressed for 3-4 seconds, but should not immediately stick to your fingers. Polyepoxy resin achieves this state after 3+/-1 hours of curing (the faster the warmer the environment).
5. The composite, shaped to resemble the future denture (sphere, ellipsoid, sausage), is quickly but smoothly and carefully pressed in immediately after removing the tampon. Initial shaping is done with the fingers, then lightly shaping is completed by biting the opposite teeth.
6. Over the course of 5-6 hours, the teeth, tongue, and cheeks will self-shape the new formation in the jaw. It is important to closely monitor this process, as an irregular relief after hardening will cause discomfort during the initial stages of chewing (the epoxy denture will then self-grind).

We consider the following important points for self-installation:

A. Use pure epoxy adhesive – avoid purchasing it from supermarkets and home improvement kit markets. This is because they are typically diluted with fatty or plasticizing additives, which reduce adhesion and strength. These kits may also contain low-quality hardeners. Using them can result in under-curing in the mouth and rapid loss of the adhesive. For use, use pure resin (in 1-2 liter containers), jewelry epoxy kits, or DIY kits.

B. The epoxy composition can be filled with powders free of large inclusions – dental powder, millet plaster or cement, or clay. Filling is optional – the original epoxy composition can withstand loads well in a warm, humid environment, and improper filling can weaken it (create pores and weak spots) (Figure 7).

Figure 4 clearly shows the condition of the self-installed denture (see Figure 1) after one month of active use. For clear markings, the test subject rinsed only with red alcohol-based solutions (wine). The denture was removed in the usual manner (with gentle rocking movements) and cleared of food. Food debris was noted on the sides and in one spot on the bottom of the denture. However, the different coloring indicates that the contact area (bottom surface) withstood the test period and loads well. The composite showed no signs of decomposition or even swelling. It was self-installed using the well-known Korega gel, and a day later (when the gel had dissolved), it was cleaned and reinstalled on the epoxy base. Over the following period, the patient stopped complaining of both discomfort when chewing and the associated pain from the aching tooth (which had plagued him for several decades). It should be noted that any destruction of such a prosthesis, or even simple discomfort, can easily be replaced with a new epoxy one. Similar results were obtained when restoring another set of teeth, the upper lateral series. This case is similar to the one described above, in a rather advanced destructive stage with signs of very deep caries (Figure 8). The installed polyethylene epoxy bridge-like prosthesis was attached only to the remaining teeth, the gums, and the implant of the fifth tooth. It fell out and was reinserted several times until it became firmly established within six months. Then it fell out again and was immediately reinserted again (in the fall of 2025), af-

ter which it has been functioning successfully to this day (2026). The patient stopped complaining of regular pain and inflammation in the area of these teeth, which had been present since childhood for many years (with periodic displacement or loss of tooth fragments), and he noted the ability to chew hard and firm foods (which he had long been unable to do before the epoxy prosthesis). Over 2 years of observation, the epoxy composite retained its integrity, although it became saturated with waste products (Figures 8-10). shows a unique case - a child's self-restoration of a completely decayed primary tooth (5) and adjacent molar (6). The filling had fallen out and been replaced several times over the course of two to three months, but then functioned successfully for three years, falling out only in early 2026. There were no signs of inflammation or secondary caries under the filling (which remained intact). The teeth, scheduled for surgical removal four years ago, are still (!) functional. The importance of such techniques and materials is difficult to overestimate. It's unlikely there's an adult who hasn't experienced problems with decayed primary teeth and their subsequent treatment/restoration. After all, in addition to the financial and time costs, there's also the long-term psychological discomfort of waiting for the surgery, the surgery itself, and the aftereffects (which can last for years or even a lifetime).

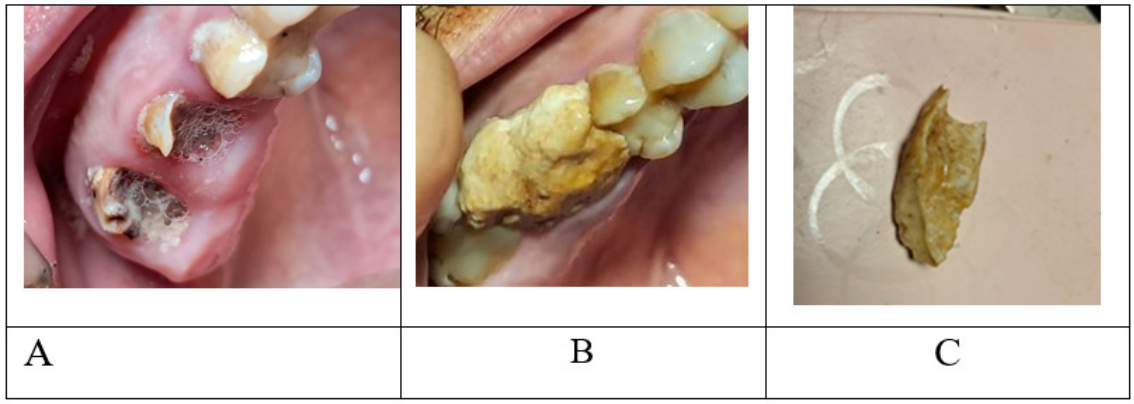

Figure 8: Fully destroyed teeths (6 and 7) before (A) and after self-restauration, and sample of used dental epoxy prosthesis after 1 month of *in-vivo* working.

Figure 9:

A. Example of mobile dental workstation
B. And samples of epoxy-filling in molar
C. Fallen epoxy-filling for molar and epoxy-filling for permanent adult tooth.

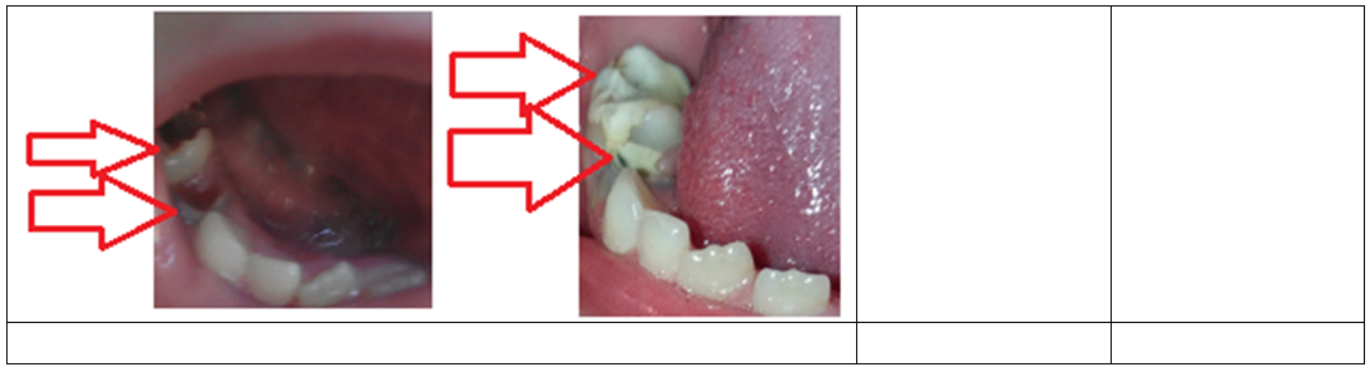

Figure 10: Example of restoraion of destroyed children's molars in 2021, and fragments of epoxy-fillers after 4 years of work *in-vivo.*

Conclusion

1. A brief theoretical justification for the necessity and feasibility of using polyepoxides for *in-vivo* self restoration and prosthetics of teeth at advanced stages of decay is presented.
2. Experiments have shown that epoxy composites are comparable in performance to natural and artificial dental materials.
3. *In-vivo* self-restorations (including under extreme conditions) demonstrate the high efficacy of the proposed method.
4. Detailed practical recommendations for epoxy restoration in non-clinical settings for non-specialists are presented.

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