# Tooth Restoration Option with the Use of Pins

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**Abstract**

We've made a comparison of characteristics of the classical restoration method with the suggested one. For this job we examined 62 patients. Twenty seven of them were treated with the classic technique and 35 were treated with the suggested method. The observation period was 2 years. During this period patients were examined twice a year. At each visit the quality of the work done was evaluated on several criteria: the time spent on reconstruction, X-ray control of edge fitting of fillings for solid tissues; clinical assessment of direct restorations during the above mentioned observation period. The study revealed that with the proposed technique one can save up to 10 minutes of working time on average without the loss of quality of the end result.

**Key words:** pin, tooth restoration.

**Вариант реставрации зубов с использованием штифтов**

Мы провели сравнительную характеристику классической и предложенной нами методики реставрации зубов с помощью внутрикорневых штифтов. Для проведения данной работы нами было исследовано 62 пациента, у которых была проведена прямая реставрация зубов, используя классическую методику (27 пациентов) и методику, предложенную нами (35 пациентов). Срок наблюдения составил 2 года. В течение данного периода пациенты проходили 2 раза в год контрольное обследование. При каждом визите качество проделанной работы оценивалось по нескольким критериям: время, затраченное на выполнение реконструкции; рентгенологический контроль прилегания края пломбы к твёрдым тканям и слоёв реставрации между собой; клиническая оценка состояния прямых реставраций в учётные периоды. В результате исследования было выявлено, что предложенная нами методика позволяет экономить рабочее время, в среднем на 10 мин., без потери качества конечного результата.

**Ключевые слова:** штифт, зубов реставрация.

## Introduction

One of the most frequent pathologies in everyday practice of each dentist is a partial or complete destruction of the crown of the tooth. Pathogenesis can be congenital (enamel hypoplasia, fluorosis, dysplasia Kapdepona, etc.) or acquired (caries, wedge-shaped defects, abnormal abrasion, erosion of hard tissue, etc.) disorder in the integrity of teeth. Causes of destructions can be a variety of external and internal factors, as well as their combination.

The most complete classification of this type of pathology was suggested by M. Dechaume, and was later supplemented by V. Burlui. It covers and integrates existing clinical forms into four classes, facilitating a plan of treatment [1, 2].

Depending on the degree of destruction of the crown of the tooth, a variety of prosthetic and therapeutic methods of reconstruction can be applied. Most often, small and medium-sized defects are restored with the help of direct restorations and do not present significant complexity to the overall treatment [3, 4, 5]. It's more difficult to choose a method of treatment with total or subtotal destruction of the tooth crown. Depending on your goals, you must select the most appropriate treatment plan, taking into account the individual characteristics of each clinical case. In these situations you can use direct, indirect and combined methods for the reconstruction of coronal tooth structure.

Currently, with the high level of technological development for direct restorations, it is possible to reconstruct of reconstructing the anatomical shapes of the tooth with the use of composite materials, even with extensive or complete destruction. The development in this area of dentistry has led to a point where some orthopedic designs (tabs, pin teeth, single crowns, etc.) are rapidly losing their relevance, giving way in many respects to the modern adhesive techniques of restoring the tooth crown [4, 5, 6].

Despite the high level of development of these technologies, it is often necessary to reinforce the direct restorations in cases of partial or complete destruction of the crown of the tooth. Intraradicular pins of various shapes and made of different materials are most often used for this purpose. At present there are two kinds of pins: active (threaded for fixation of dentin root canal) and passive (fixed only at the expense of cement) pins. The difference depends on the material of which the reinforcing elements are made of - either metal (steel, titanium) or non-metal (fiberglass). For the better fixation a root canal is treated with sweeps of appropriate taper and is filled with different cements, mostly chemical curing. Their polymerization time is 10-15 minutes on average. After strengthening the pins one begins to form the crown of the tooth or stump with the help of composite materials [7].

Long setting time of cement at the fixation of intraradicular pins leads, in our view, to the loss of working time which can be saved by using our proposed method, without the loss of quality of end results.

## The purpose of the study

1. Optimization of direct restoration techniques using intraradicular pins in the case of total or subtotal destruction of the crown of the tooth.

2. Clinical verification of the effectiveness of proposed method.

## Material and Methods

The studies were conducted on the basis of the scientific laboratory in the Department of Oral and Maxillofacial Surgery at the Nicolae Testemitanu State Medical and Pharmaceutical University and in the private clinic «Clinica profesorului D. Scerbatiuc», SRL.

For this study 62 patients (37 women and 25 men) aged 21 to 67 years (mean age of 42.3 years) were selected with partial or total destruction of the crown part of a tooth. Devitalization of these teeth was performed because of complications of caries, at least two years before the work. Forty eight of these teeth (31 distal and 17 frontal) have been restored as a support for the prosthetic restorations.

The remaining 14 teeth (9 distal and 5 frontal), were restored as independent direct restorations. This was carried out by the direct method using active titanium pins. For the fixation, the chemical curing glass ionomer cement "CX-Plus" (Shofu) was used. Crown of the tooth was restored using such composite photopolymer materials as: Te-econom (Vivodent), Amelogen (Ultradent), Spectrum (Dentsply), as well as fluid photopolymer I-Flow (Medicinos Linija UAB). The observation period was about 2 years.

Depending on the methodology used, patients undergoing direct restoration were divided into 2 groups. Group 1 (control group) included 27 patients (19 women and 8 men) whose teeth had been restored with the classical direct method (17 distal and 10 frontal). Of these, in 22 restorations (15 distal and 7 frontal) teeth were reconstructed as a support for prosthetic designs, and in 5 (2 distal and 3 frontal), as independent reconstructions of the crowns.

To Group 2 (experimental) were assigned 35 patients (18 women and17 men), whose teeth were restored using the proposed technique (29 distal and 9 frontal). Of these, 26 (24 distal and 2 front) teeth were restored as a support for the prosthetic and 9 (5 distal and 4 frontal) as a direct restoration, with the total reconstruction of the anatomical shape of the teeth.

The technique used in the restoration of the coronal part of teeth in the first group included the following steps:

1. Abrasive preparation of hard dental tissues.
2. Formation of the cavity to the desired shape and taper in the outer part of the root canal to fix the pin.
3. Mixing of glass ionomer cement and then its introduction in the prepared canal and pin fixation. The solidification time is 10 minutes.
4. Acid etching of dental tissues for 60 seconds followed by processing with adhesive (gel?) and polymerization.
5. Layer by layer restoration of the tooth crown, according to the stated objectives using the light-cured composites mentioned above, with the exception of liquid photopolymer.

In the second (experimental) group of patients the following algorithm of reconstruction was used:

1. Dissection of hard tissues.
2. Preparation of the outer part of the root canal for the introduction of the pin. The formation of the necessary depth and taper.
3. Processing of dental tissues, including the seat for the pin with the etching gel for 60 seconds followed by application of adhesive and its polymerization (fig. 1).
4. Mixing and the introduction of glass-ionomer cement for fixation of the pin (fig. 2).

If working with an assistant, stages 3 and 4 can be performed simultaneously. That is, during glare of adhesive the cement for securing the pin can be mixed simultaneously.

5. Application of liquid photopolymer on the non-cured cement over its entire surface, and its polymerization. Thus, we create a solid base over the glass-chemical curing, which allows you to continue the reconstruction process, while it is still curing (fig. 3).
6. Finalizing the restoration according to stated objectives of the above light-cured composites (fig. 4).

As seen above, both techniques are very similar and differ by a sequence of stages and a liquid photopolymer.

## Results and discussions

As has already been noted, the observation period was about 2 years, during which both techniques were comparatively evaluated. Assessment of the restorations - was carried

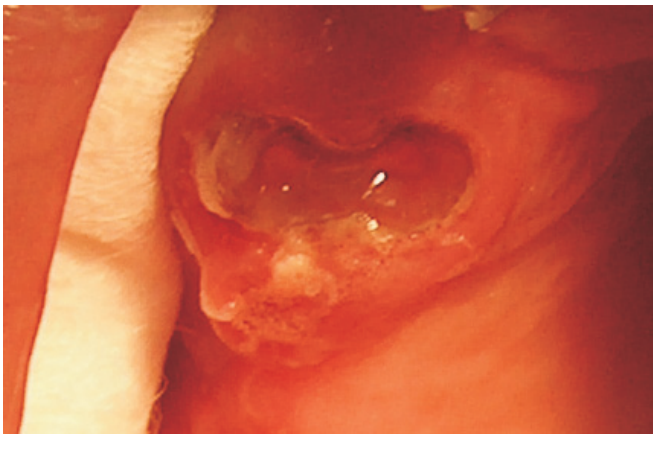

**Fig. 1. The outer part of the root of the 14th tooth after abrasive and adhesive preparations.**

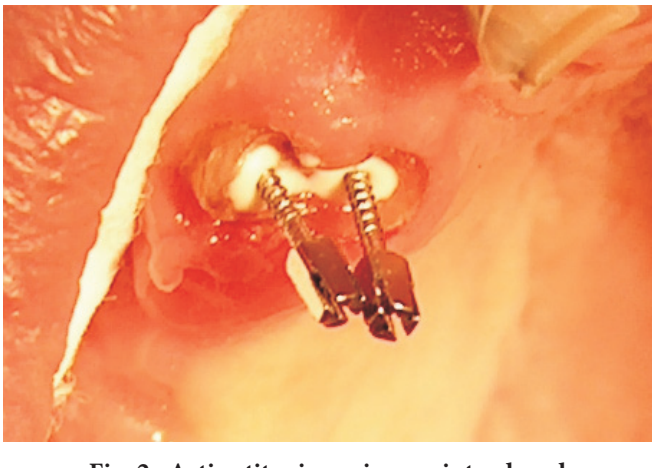

**Fig. 2. Active titanium pins are introduced and fixed into the 14th tooth root canal.**

out after 6, 12 and 24 months. The criteria of evaluation for both methods were:

A) Time spent for the reconstruction.

B) X-ray control of adjoining edge seals for solid tissues and restoration layers.

C) Clinical assessment of direct restorations during the observation period.

Based on the objectives in this paper, priority was given to control the stability of pin tumbler designs (tab. 1).

As can be seen from the data presented in table 1, in the case of the proposed method an average of ten minutes of the dentist's work time can be saved. This difference is obtained both with the self-restoration technique and the formation of a supporting stump for prosthetic designs. From the description of the compared methods of direct restoration it can be seen that the difference in elapsed time is due to changes in the sequence of stages of recovery and application of liquid photopolymer. The latter, having a high fluidity, does not require condensing, allowing it to be applied directly to glass ionomer cement.

In our study we were interested in the density of the adjoining layers of materials used in the restoration, which we tested with RVG. Moreover, we are primarily interested in the boundary between the uncured glass ionomer cement and liquid photopolymer, since as in any freezing process, and especially with a chemical cure, shrinkage can occur. This can lead to partial or complete separation of the layers at the boundary of their connection. To minimize the risk of this problem, we paid special attention to the time and technique of mixing glass ionomer cement as well as compliance with the proportions of powder - liquid.

Our results indicate that the exfoliation of materials is not observed either immediately after the restoration or after 6-24 months. This suggests that the degree of shrinkage in both groups is minimal. Problems associated with the integrity of the restoration are usually detected by x-ray scheduled at 12 and 24 months. In the first group, in the case of restoring the anatomical shape of the tooth, only 1 case was recorded of violation of fit after 1 year, representing 3.7% of the total number of restored teeth. In the control group disintegration of the reconstruction was found in:

- 1 case after a year (4.5% of those with recovered stump and 3.7% of the total number of restored teeth in a group);

- 2 cases after two years (9% of those with recovered stump and 7.4% of the total number of restored teeth per group).

**Fig. 3. Liquid Photopolymer Composite incurred over the uncured glass ionomer cement.**

**Fig. 4. The stump reconstructed with composite on the titanium pins, as support for prosthetic design.**

During the observation period there were problems with 4 direct restorations in the control group, which amounted to 14.8%.

RVG control of direct restorations of patients of the second group also did not reveal any defects either immediately after or after 6 months. In the case of restoring the anatomical shape of of the tooth in the patients from the experimental group, violations of fit were found within two years after the restoration. This corresponds to 11.1% of the number of independent restorations or 2.9% of the total number of patients

**Table 1**

**Comparative evaluation of direct restorations by different methods**

| Group | Restoration Type | Work time (min.) | Number of restorations | The presence of defects in X-ray control (pores, violation of fit) | | | | Uncementing of pins | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Right after finishing work | After 6 months | After 12 months | After 24 months | After 6 months | After 12 months | After 24 months |
| I | Self-restoration | 55-60 | 5 | --- | --- | 1 | --- | --- | --- | --- |
| | Stump for prosthesis | 35-40 | 22 | --- | --- | 1 | 2 | --- | --- | --- |
| II | Self-restoration | 45-50 | 9 | --- | --- | --- | 1 | --- | --- | --- |
| | Stump for prosthesis | 25-30 | 26 | --- | --- | 1 | 2 | --- | --- | --- |

of the experimental group. Testing the restorations carried out for further prosthetic placement revealed:

- The violation of fit was found in 1 of the stumps after one year (3.8% of those with recovered stump and 2.9% of the total number of patients in experimental group);

- Within two years violation of fit was found in two restorations (7.7% of those with recovered stump and 5.7% of the total number of patients in experimental group).

During the observation period in the experimental group, there were also found violations of the integrity of 4 direct restorations, which will amount to 11.4%.

In our opinion, breaches of fit in both groups are primarily associated with reduced adhesive ability of long devitalized tissues of the tooth, and a small contact area of restorative materials to dental hard tissue. An additional cause may be the complexity of isolating the restoration of the field of oral fluid, because of complete or partial absence of the tooth edges above the gum, which makes microleakage during the application of filling material more difficult. Several other factors as well as their combinations may lead to shortening the period of service of this type of restorations. Despite the difficulties in the implementation of direct restorations with pins; this method remains relevant and effective enough. The data obtained in our work supports this. In addition, an important feature of direct restorations is their "maintainability", which allowed us to avoid the complete destruction of the restored part of the tooth. In all cases of violation of fit, this defect was corrected by using composite materials without complete replacement of the restoration.

It is important to note that the full decementation of the pins has not occurred during the observation period in either group, thus indicating a high resistance to stress in this technique of direct restorations.

Analyzing the data shows that both methods have roughly the same index of defects in design: 11.4% in the experimental group, and 14.8% in the control group. This suggests the similarity of end results for both techniques. The advantage of the proposed method is time saving without loss of quality, as demonstrated by this study. In our view, this argument is significant enough to this technique to take its rightful place in the arsenal of every dentist.

## Conclusions

1. The proposed method of direct restorations with pins is not inferior to the characteristics of the classical method.

2. Modified sequence of stages of investigated methods allows saving about 10 minutes of working time whale carrying out the same amount of work, as compared to using the classical technique.

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