

# Comparative Characteristics of Clinical Application of the Latest Fixing Creams for Removable Plate Prostheses

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**Abstract:** The objective of this study was to determine the efficacy and benefits of the most common adhesive systems on the market based on their comparative analysis. The clinical efficacy of adhesive compositions was studied in patients with complete absence of the teeth on the mandible with complex anatomical and functional conditions of the prosthetic bed. The patients used fixing creams immediately after prosthesis placement. In the 1st group the patients used PresIDENT Gel (Betafarma S p A), in the 2nd group the patients used Protefix gel (Queisser Pharma), the 3rd group patients used Lacalut dent cream (Dr. Theiss Naturvaren GmbH), and the 4th group included the patients who used Corega Comfort cream (GSK). The chewing test of N. M. Urazaev was used to assess clinical functionality. A modified T. Mirsaev test was used to assess the fixation of complete removable dentures on the mandible. While studying chewing efficacy it was found that the use of adhesive creams reduced the chewing period, it was especially significant in the application of the adhesive "Corega Comfort" (40%), the number of movements decreased by 46.1% ( $p < 0.05$ ). During the long-term use, Corega Comfort adhesive cream improved chewing efficacy by 14.3%. It should be noted that the masticatory efficacy did not improve in the adhesives "Lacalut dent" in the course of time. High rates of improvement were observed when applying Protefix cream (16.6%). All adhesives help improve chewing efficacy: the chewing period was reduced, it was especially significant in application of the adhesive "Corega Comfort" (by 40%), the reduction in the number of movements before swallowing was reduced by 46.1% ( $p < 0.05$ ). During the long-term use, Corega Comfort adhesive cream improved chewing efficacy by 14.3%. It should be noted that the masticatory efficacy did not improve in the adhesives "Lacalut dent" over time. High rates of improvement were observed in the use of Protefix cream (16.6%). The application of adhesive systems in full removable prosthetics, improves significantly the fixation force from 45.9% when using the cream "Lacalut dent" to 104.9% when using the adhesive "Corega Comfort".

**Keywords:** Full Removable Prosthesis, Adhesives, Corega Comfort Cream, Masticatory Efficacy, Fixation Force

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## 1. Introduction

Complete removable prosthetics is a significant social and medical problem. Thousands of scientific papers worldwide are devoted to the improvement of removable structures [1-3]. Despite the rapid development of implant methods, the solution of issues related to the treatment of patients with complete absence of the teeth remains a major problem in modern orthopedic dentistry [4]. One of the important factors for the full restoration of the masticatory apparatus function in full removable prosthetics is the adaptation to the prosthesis with reliable fixation, stabilization and balance. Adhesive systems have long been proven to ensure reliable fixation as one of the components of functioning of a removable prosthesis under

difficult anatomical conditions for prosthetics [5-7].

The use of adhesive creams has shown that the improvement of the fixation of plate prostheses occurs both in newly manufactured and in a slight change in the relief of the prosthetic bed in its prolonged use [8].

The main disadvantages identified by scientists in fixation adhesive systems are: insufficient antiseptic properties, insufficiently strong adhesiveness (duration of reliable fixation of 3-5 hours) and others [9, 10]. A large number of scientists show that adhesive systems are needed in clinical practice to increase the functional value of complete removable dentures and recommend improving the composition and properties of compositions [4].

Based on the above mentioned, we believe that the issue of

improving the quality of fixing creams is relevant and urgent in modern orthopedic dentistry.

In recent years, a new cream has appeared on the market of adhesive systems, developed by GSK specialists - Corega Comfort, manufactured using Adaptagrip technology.

For the purpose of comparative analysis, we investigated the clinical efficacy of the new development and the main fixing creams available in Ukraine.

## 2. Materials and Methods

To achieve the goal of the study, we studied the clinical efficacy of these compositions in patients with complete absence of the teeth on the lower jaw with complex anatomical and functional conditions of the prosthetic bed. Terms of using complete removable dentures, which were made repeatedly, were not less than 6 months (Figure 1).



**Figure 1.** A photo of the oral cavity of the patient of the 4th group who took part in the study.

The patients were divided into 4 groups of 12 people approximately equal in sex. The patients used fixing creams immediately after prosthesis placement. In the group 1 the patients used PresIDENT Gel (Betafarma S p A), in the group 2 the patients used Protefix gel (Queisser Phrma), the group 3 patients used Lacalut dent cream (Dr. Theiss Naturvaren GmbH), and the 4th group included the patients who used Corega Comfort cream (GSK).

A chewing test of N. M. Urazaev was employed to assess clinical functionality [11], for which they used a peanut weighing 0.8 g. To adapt to the test, the patient was asked to chew a whole nut without fixing the time before it. After rinsing the dentures and rinsing with 1 glass of mouthwash, the cream was applied, the patients were offered 0.8 g of a nut, and the patient was asked to chew it until the swallowing reflex. The number of chewing movements was recorded - the patient raised his hand. The time for chewing of 0.8 g of the nut was counted. The test was performed three times for 3 months, each month from the beginning of the experiment. The time for 1 chewing movement was measured.

A modified test by T. Mirsaev, 2004 was employed to assess the fixation of complete removable dentures on the lower jaw [12]. A metal plate with a nylon thread fixed to it was attached to the distal edge of the prosthesis with the help of fast-hardening plastic. The thread was passed through a roller. The prosthesis together with the adhesive cream was introduced into the oral cavity. A similar operation was performed without the adhesive the next day. The study was performed with a minimum open mouth of 0.8 cm. The adhesive was pressed tightly to the prosthetic bed for five minutes. The head was fixed so that the Kamper horizontal was perpendicular to the thread. Then fine balls were carefully added to a specially fixed tank. Thus the weight of the load was determined at the time of separation of the prosthesis. The balls were weighed on the electronic scales.

## 3. Results and Analysis

According to the results of the study, in all cases of applying creams, the quality of prosthetics is much higher than without the use of adhesives. (Table 1).

**Table 1.** The results of the study of masticatory efficiency in the use of adhesives for fixing complete removable dentures,  $M \pm m$ .

Day of the study		Groups of patients				
		Without adhesive	1 group	2 group	3 group	4 group
1		2	3	4	5	6
1 <sup>st</sup> day	The number of movements, times	26±1	22±1 $P_1 < 0.05$	18±1 $P_1 < 0.01$	16±1 $P_1 < 0.01$	14.0±1.5 $P_1 < 0.01$
	Hour, sec	40±2	32±2 $P_1 < 0.05$	30±1 $P_1 < 0.05$	30±0.5 $P_1 < 0.05$	24±2 $P_1 < 0.01$
30 <sup>th</sup> day	The number of movements, times	26±1	21±1.0 $P_1 < 0.05$ $P_2 > 0.05$	16±1.5 $P_1 < 0.01$ $P_2 > 0.05$	16±1.5 $P_1 < 0.01$ -	12±1 $P_1 < 0.05$ $P_2 > 0.05$
	Hour, sec	40±2	33±1.5 $P_1 < 0.05$ $P_2 > 0.05$	28.0±2.5 $P_1 < 0.05$ $P_2 > 0.05$	32.0±0.5 $P_1 < 0.01$ $P_2 < 0.05$	22±1.5 $P_1 < 0.01$ $P_2 > 0.05$
60 <sup>th</sup> day	The number of movements, times	26±1	22.0±1.0 $P_1 < 0.05$ -	15±2.0 $P_1 < 0.05$ $P_2 > 0.05$	16 $P_1 < 0.01$ -	12±0.5 $P_1 < 0.01$ $P_2 > 0.05$
	Hour, sec	40±2	33.0±1.0 $P_1 < 0.05$ $P_2 > 0.01$	26±1 $P_1 < 0.01$ $P_2 > 0.01$	30±1.5 $P_1 > 0.05$ $P_2 > 0.01$	22±0.5 $P_1 < 0.01$ $P_2 > 0.01$

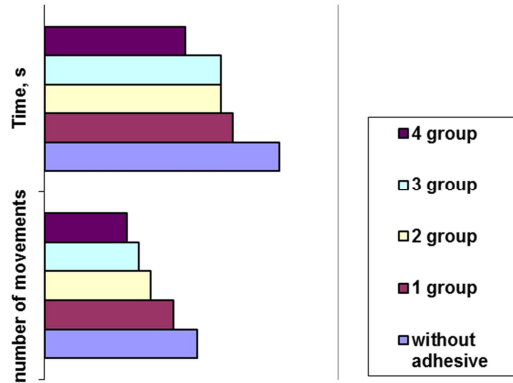
Note:

$p_1$  - coefficient of reliability in comparison with the results of the test without adhesive;

$p_2$  is the reliability coefficient compared to the test results on the 1st day of the experiment.

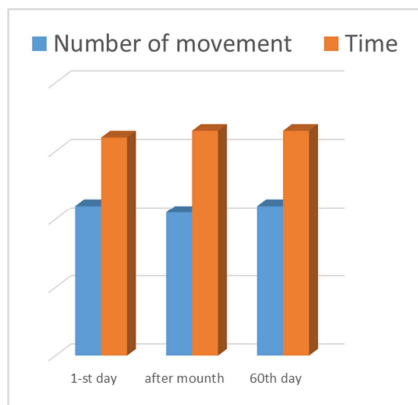
The study found that the use of any adhesive led to improved chewing efficacy, as evidenced by the reduction of

time to chew food (in the 1st group - by 15.4%, and in the 2nd group - by 30.7%, in the 3rd group - by 38.5%, in the 4th - by 46.1%), a decrease in the number of chewing movements (in the 1st group - by 20.0%, and the 2nd and 3rd group - by 25.0%, 4th - by 40.0%) ( $P_1 < 0.01$ ) (Figure 2).

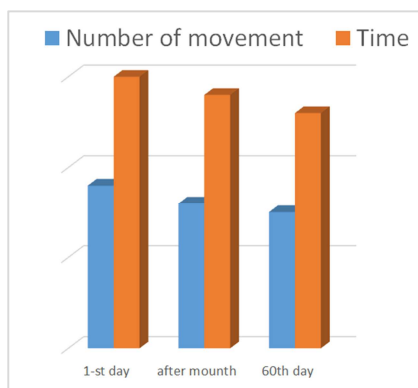


**Figure 2.** Comparison of the results of the chewing test in patients with complete absence of the teeth when using different adhesives.

When using adhesives for a long time, it should be noted that the chewing efficacy when applying the adhesive "PRESIDENT" (group 1) increases over time (Figure 3), but the reliability is low ( $P_2 > 0.05$ ).



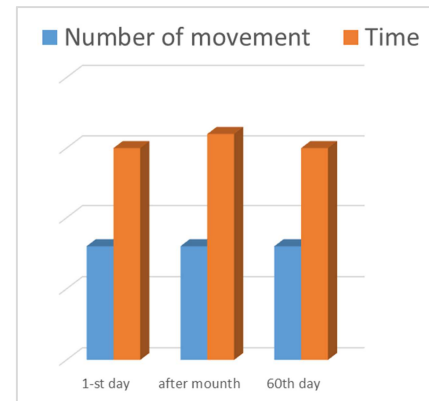
**Figure 3.** A change in masticatory efficacy in the prolonged use of complete removable mandibular prostheses with the use of adhesive "PRESIDENT" (Group 1).



**Figure 4.** A change in masticatory efficacy in the prolonged use of complete removable mandibular prostheses with the use of the adhesive "Protefix" (Group 2).

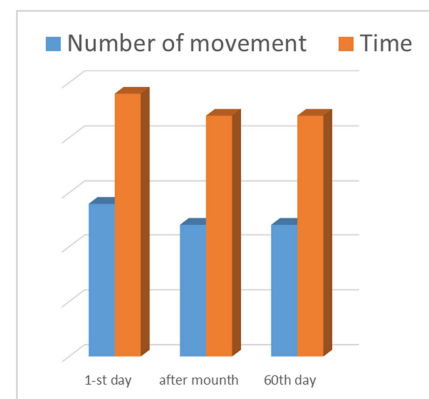
In the second group of the study (application of "Protefix" cream) the growth is more pronounced (reduction of the number of movements for 3 months by 16.6%, reduction of chewing time by 13.3%) (Figure 4).

While studying masticatory efficacy in patients with complete absence of the teeth on the lower jaw when applying the cream "Lacalut dent" it was found that the indices did not change significantly (Figure 5).



**Figure 5.** A change in masticatory efficacy in the prolonged use of complete removable mandibular prostheses with the use of the adhesive "Lacalut dent" (3rd group).

While studying the 4th group (the use of Corega Comfort cream) there was a significant increase in the efficacy of chewing in the patients. Thus, there was a decrease in the number of chewing movements to the swallowing reflex by 14.3%, and a decrease in chewing time by 8.3% (Figure 6).



**Figure 6.** A change in masticatory efficacy in the prolonged use of full removable mandibular prostheses with the application of the adhesive "Corega Comfort" (Group 4).

Thus, when studying the efficacy of chewing, it was found that the use of adhesive creams reduced the chewing period, it was especially significant in the application of the adhesive "Corega Comfort" (40%), reducing the number of movements by 46.1%) ( $p < 0.05$ ).

In the long-term use Corega Comfort adhesive cream improved chewing efficacy by 14.3%. It should be noted that the masticatory efficacy did not improve in the adhesives "Lacalut dent" over time. A high level of improvement was observed when applying Protefix cream (by 16.6%).

The results of the study of stability of a complete removable prosthesis in the oral cavity when using different adhesives are presented in the Table. 2.

According to the data obtained, it should be stressed that

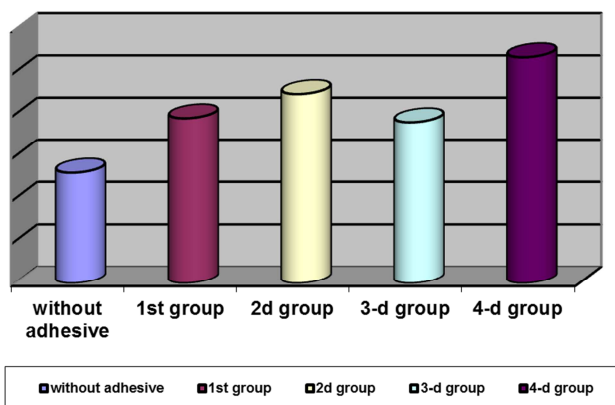
the force of adhesion of the prosthetic surface to the mucous cavity increases when using oral adhesives. The highest rates were demonstrated in the group of the patients who used Corega Comfort, fixation doubled - by 104.9% ( $p < 0.01$ ).

**Table 2.** The results of measuring the fixation force of the denture on the lower jaw when using different adhesive systems,  $M \pm m$ .

Study group	Force of fixation (in grams)				
	Without adhesive	1 group	2 group	3 group	4 group
Force of fixation (g)	522±42	781±65	896±40	762±51	1070±85
Reliability (P)	-	$p < 0.05$	$p < 0.01$	$p < 0.05$	$p < 0.01$

Note: P – reliability in comparison with the fixation force of prostheses without the use of adhesive creams.

In the 2nd group, the fixation force ("Protefix" cream) increased by 71.6% ( $p < 0.01$ ), in the 1st group ("PresIDENT" adhesive) this figure was 49.6% ( $p < 0.05$ ). In the 3rd group ("Lacalut dent") the fixation force also increased significantly - by 45.9% ( $p < 0.05$ ) (Figure 7).



**Figure 7.** Indices of measuring the fixation force in patients with complete absence of the teeth on the lower jaw when using different adhesive systems, g.

Our studies have shown that the use of adhesive systems with full removable prosthetics significantly improves the fixation force from 45.9% when using the gel "Lacalut dent" to 104.9% when using the adhesive "Corega Comfort".

Clinical results of the study of the quality of fixation and quality of life of patients with edentulous jaws are presented in studies G. Ohwada et al [13]. They studied on 200 edentulous patients wearing complete dentures aimed to evaluate the effects of adhesives. These results confirmed our hypothesis in this study about the different clinical efficacy of modern fixation gels depending on the life parameters of a patient with a complete removable dentures.

The research results obtained by us correlate with the results obtained by our colleagues. So, Sergio Lopez-Garcia et al. [14] investigated a range of dental adhesives and found that all denture adhesives tested them led to reduction in pH, decrease of cell viability, ROS production, aberrant cell morphology, and induction of apoptosis of cells. This may be the reason for such a difference in the physical parameters of clinical symptoms. This may be the reason for such a difference in the physical parameters of clinical symptoms.

In a major analytical article Neveen Elabbasy et al. [15] summarized research on this issue over the past few years and concluded that owed favorable results for DAs on

retention and stability of complete dentures, masticatory performance, patient's comfort and satisfaction. Due to the heterogeneity of the outcomes, unclear/high risk of bias and small sample sizes, the quality of the evidence was very low.

## 4. Conclusions

When comparing the clinical characteristics of the use of gels for additional adhesion of complete removable dentures it was revealed:

1. All adhesives help improve chewing efficiency: the chewing period was reduced; it was especially significant while using the adhesive "Corega Comfort" (40%), the reduction in the number of movements before swallowing decreased by 46.1% ( $p < 0.05$ ).
2. In the long-term use of the adhesive cream "Corega Comfort" chewing efficacy improved by 14.3%. It should be noted that the masticatory efficacy did not improve in the adhesives "Lacalut dent" over time. The best improvement was observed when applying Protefix gel (by 16.6%).
3. The use of adhesive systems in full removable prosthetics, significantly improves the fixation force from 45.9% when using the gel "Lacalut dent", to 104.9% when using the adhesive "Corega Comfort".

Thus, more studies are necessary to get a comprehensive study of the problem, confirmation of various hypotheses that explain the rather difficult to explain clinical characteristics of fixation gels.

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