

dence of small bounded edentulous spaces among school children in Lviv was significant, in the range of 10%. It had a tendency to increase with age substantiating the need for prosthetic rehabilitation of school age individuals.

**Keywords:** *small bounded edentulous spaces; children and ado-*

*lescents; incidence; development dynamics.*

Надійшла: 27.01.2017

Завершено рецензування: 28.02.2017

Прийнято: 13.03.2017

DOI: 10.21802/gmj.2017.1.8

Z.R. Ozhohan, A.V. Biben

### Clinical Aspects of Combination of Ceramic and Acrylic Occlusal Surfaces

Department of Prosthetic Dentistry

Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine

E-mail: [Andriiko07@gmail.com](mailto:Andriiko07@gmail.com)

**Abstract.** The objective of the research was to develop and substantiate the methods of constructing the occlusal surfaces when manufacturing aesthetic fixed restorations through the combination of different materials.

**Materials and methods.** The study included 65 patients with ceramic and acrylic occlusal surfaces of aesthetic fixed dental prostheses. Group I included 21 patients with a combination of ceramic and acrylic occlusal surfaces. Group II included 22 patients with a combination of ceramic occlusal surfaces. Group III included 22 patients with a combination of acrylic occlusal surfaces. The patients were observed 3, 6 and 12 months after prosthetic repair.

**Results.** The greatest increase in the occlusal contact surface area of fixed restorations was observed in Group I, that is, when combining dental prostheses with ceramic and acrylic occlusal surfaces. Considering uneven abrasion of the occlusal surfaces, we do not recommend to combine different materials when veneering the occlusal surface of the antagonistic teeth.

**Conclusions.** This study demonstrated the important role of the correct combination of materials when veneering the occlusal surfaces. Physical and chemical properties of materials, namely the abrasion resistance play a significant role in the long-term denture functioning.

The smallest increase in the occlusal contact surface area was observed in Group II when combining ceramic occlusal surfaces. It was due to a good abrasion resistance of ceramics as compared to acrylic resin as well as the presence of the glazed layer which prevents the premature abrasion of the occlusal surfaces of the antagonistic teeth due to lower surface roughness.

The combination of acrylic resin and ceramics when constructing the occlusal surfaces of fixed restorations in Group I demonstrated the highest rate of the increase in the occlusal contact surface area – 9.93%. It was due to a low hardness of acrylic resin and its high surface roughness. In addition, there was observed an uneven abrasion of the occlusal surfaces resulting in periodontal tissue overload, thereby negatively affecting denture functioning.

**Keywords:** *prosthetic appliances; occlusal surfaces; acrylic resin; ceramics.*

#### Problem statement and analysis of the recent research

At the current stage of its development prosthetic dentistry uses a wide range of construction materials - both modern and those that have been known for a long time [1].

The combination of modern as well as traditional techniques and materials allows using many variants of prosthetic appliances in the oral cavity; however, the number of complications including ceramic chipping and the occlusal surface abrasion increases and, consequently, aesthetic, functional and anatomic values of the prostheses reduce [2]. It is due to the combination of prosthetic appliances being different from each other in construction materials, design as well as the methods of manufacturing – metal, acrylic, combined ceramic (low-temperature ceramics, high-

temperature ceramics, feldspathic ceramics, alumina-based ceramics) and metal-free prosthetic appliances [2], which is contrary to basic principles of tribology.

A high degree of the aggression of ceramics towards the antagonistic teeth as well as a low abrasion resistance of acrylic resin remains the problem being difficult to solve. This fact is explained by several factors: ceramics possesses higher hardness; in addition, it consists of fine particles of different sizes which increase its surface roughness; the presence of surface and subsurface porosity is typical for ceramics.

The combination of various materials when constructing the occlusal surfaces always negatively affects the durability of the prostheses due to their different physical and chemical properties [2].

All these factors indicate the need for developing the methods of the combination of aesthetic dental prostheses made of different construction materials in the oral cavity.

**The objective** of the research was to develop and substantiate the methods of constructing the occlusal surfaces when manufacturing aesthetic fixed restorations through the combination of different materials.

#### Materials and methods

The study included 65 patients with ceramic and acrylic occlusal surfaces of aesthetic fixed dental prostheses.

Group I included 21 patients with a combination of ceramic and acrylic occlusal surfaces.

Group II included 22 patients with a combination of ceramic occlusal surfaces. Group III included 22 patients with a combination of acrylic occlusal surfaces

Patients were observed 3, 6 and 12 months after prosthetic repair.

The state of the occlusal surface of prosthetic appliances was studied based on the data of physical examination, X-ray results and determination of the occlusal contact surface area using 3Shape TRIOS Dental System. We have used 3Shape TRIOS® 3D scanner to determine the occlusal contact surface area since at this stage computer occlusiography provides the most accurate results. We have not used any other computer methods as they are difficult to use in contrast to 3Shape TRIOS [3]. The accuracy of 3Shape TRIOS® 3D scanner is proven to be one of the highest [4] and the margin of error does not exceed 7 μm. Therefore, we consider the use of this scanner to be justified.

To determine the occlusal contact surface area, we have used the following method. At first, the upper jaw was scanned using 3Shape TRIOS® 3D scanner in the TRIOS Cart configuration, and then, the lower one was scanned. Next, dentitions in occlusion were scanned. Then, the occlusal surface area was determined using computer software of 3Shape TRIOS Dental System.

The authors [5] stated that in patients with intact teeth the mean

occlusal contact surface area of the 36<sup>th</sup> tooth is 7.044 mm<sup>2</sup> and the mean occlusal contact surface area of the 46<sup>th</sup> tooth is 7.62 mm<sup>2</sup>, respectively.

The results were statistically processed using Student-Fisher's t distribution; the results were considered statistically significant at  $p < 0.05$ .

### Results

The determination of the occlusal contact surface area using 3Shape TRIOS® 3D scanner provided the following results (Table 1).

The occlusal contact surface area 12 months after prosthetic repair was the largest in Group I (8.85±0.18 mm<sup>2</sup>). It was due to physical and mechanical properties of ceramics, i.e. its aggression as well as a low hardness of acrylic resin resulting in low abrasion resistance. In addition, in our opinion, low chemical resistance of acrylic resin to adverse effects in the oral cavity as well as a higher surface roughness resulting in an increased abrasion played a certain role. In Group I, the abrasion occurred very unevenly. Ceramic occlusive surfaces tended to be less abraded. The occlusal contact surface area increased due to acrylic occlusal surfaces which negatively affected the prosthesis height and periodontal tissue overload.

In Group II, both occlusal surfaces were made of ceramics the hardness of which as well as the abrasion resistance is higher; consequently, 12 months after prosthetic repair, the occlusal contact surface area in Group II was 8.38±0.17 mm<sup>2</sup>.

The increase in the occlusal contact surface area in Group III (8.67±0.21 mm<sup>2</sup>) is explained by the fact that despite low hardness and abrasion resistance, acrylic occlusive surfaces tend to be not so much abraded as in the interaction of identical materials the abrasion coefficient equals to 1 ensuring even abrasion over the entire occlusal surface.

In our opinion, the difference between the obtained data on the occlusal contact surface area and those obtained by the authors is explained by the fact that the method of determining the surface area differed from that used by the authors. The fact that they observed young persons with intact teeth should be considered as well.

The increase in the occlusal contact surface area of fixed restorations 12 months after prosthetic repair as compared to that 3 months after prosthetic repair was 9.93% in Group I, 5.4% in Group II and 7.03% in Group III.

The greatest increase in the occlusal contact surface area of fixed restorations was observed in Group I, that is, when combining dental prostheses with ceramic and acrylic occlusal surfaces. Considering uneven abrasion of the occlusal surfaces, we do not recommend to combine different materials when veneering the occlusal surface of the antagonistic teeth.

### Conclusions

This study demonstrated the important role of the correct combination of materials when veneering the occlusal surfaces. Physical and chemical properties of materials, namely the abrasion resistance play a significant role in the long-term denture functioning.

The smallest increase in the occlusal contact surface area was observed in Group II when combining ceramic occlusal surfaces. It was due to a good abrasion resistance of ceramics as compared to acrylic resin as well as the presence of the glazed layer which prevents the premature abrasion of the occlusal surfaces of the antagonistic teeth due to lower surface roughness.

The combination of acrylic resin and ceramics when constructing the occlusal surfaces of fixed restorations in Group I demonstrated the highest rate of the increase in the occlusal contact surface area – 9.93%. It was due to a low hardness of acrylic resin and its high surface roughness. In addition, there was observed an uneven abrasion of the occlusal surfaces resulting in periodontal tissue overload, thereby negatively affecting denture functioning.

### Prospects for further research

The study indicated the need for further investigation of clinical features of combining different materials when constructing the occlusal surfaces of the antagonistic teeth to provide the highest quality of prosthetic care.

### References

- Zholudev DS. Ceramic materials in prosthetic dentistry; Ceramic based on aluminum oxide. Problemy stomatologii. 2012;5:8–15.
- Bida BI. Pryntsyty ortopedychnoho likuvannia patolohii zuboshchelepnnoi systemy pry znyzhenni vysoty prykusu, yoho prohnozuvannia ta profilaktyka: avtoref. dys. na zdobuttia nauk. stupenia d-ra med. nauk: spets. 14.01.22. "Stomatolohiia". Kyiv: 2003. 31 p.
- Mitin NE, Nabatchikova LP, Vasilyeva TA. The analysis of contemporary methods of occlusion estimation and registration on the stage of orthopedic dentistry treatment. Ros mediko-biol vestn im akad IP Pavlova. 2015;3:134–139.
- Yang X, Sun YF, Tian L, et al. Precision of digital impressions with TRIOS under simulated intraoral impression taking conditions. Beijing Da Xue Xue Bao. 2015;47(1):85–89.
- Bragareva NV. [Metody kontrolya pri vosstanovlenii okklyuzyui na ortopedicheskom prieme]. Problemy stomatologii. 2013;5:45–49.

*Ожоган З.Р., Бібен А.В.*

### Клінічні аспекти поєднання керамічних та пластмасових оклюзійних поверхонь

Кафедра ортопедичної стоматології  
Івано-Франківський національний медичний університет  
Andrijko07@gmail.com

**Резюме.** Мета. Розробка і обґрунтування методик конструювання оклюзійних поверхонь у незнімних естетичних протезах, шляхом поєднання різних конструкційних матеріалів.

### Матеріали і методи

Під нашим спостереженням перебувало 65 пацієнтів, запротезованих незнімними естетичними ортопедичними конструкціями з оклюзійними поверхнями з кераміки та акрилових пластмас.

1 група: пацієнти, з поєднанням оклюзійних поверхонь незнімних протезів з кераміки та пластмаси – 21 пацієнт;

2 група: пацієнти з поєднанням оклюзійних поверхонь з кераміки – 22 пацієнти;

3 група: пацієнти з поєднанням оклюзійних поверхонь з пластмаси - 22 пацієнти.

Обстеження пацієнтів проводили через 3,6 та 12 місяців.

**Результати.** Найбільший приріст площі оклюзійних контактів незнімних конструкцій відбувся в 1 групі, тобто при поєднанні зубних протезів з керамічними та пластмасовими оклюзійними поверхнями. Враховуючи те, що стирання відбувається нерівномірно, ми не рекомендуємо поєднувати різні матеріали для облицювання оклюзійних поверхонь зубів-антагоністів.

**Висновки.** Проведене дослідження доводить важливу роль правильного поєднання матеріалів для облицювання оклюзійних поверхонь. Фізико-хімічні характеристики матеріалів, а саме стійкість до стирання, відіграють значну роль для тривалого функціонування зубних протезів.

Дослідження засвідчує, що найменший приріст площі оклюзійних контактів спостерігається в 2 групі, при поєднанні керамічних оклюзійних поверхонь. Причиною є хороша стійкість, в порівнянні з пластмасою, кераміки до стирання, а також наявність

**Table 1. Occlusal contact surface area of the 36<sup>th</sup> tooth**

Group	Time period after prosthetic repair	Occlusal contact surface area
I	3 months	8.05±0.15 mm <sup>2</sup>
I	6 months	8.25±0.19 mm <sup>2</sup>
I	12 months	8.85±0.18 mm <sup>2</sup>
II	3 months	7.95±0.24 mm <sup>2</sup>
II	6 months	8.04±0.22 mm <sup>2</sup>
II	12 months	8.38±0.17 mm <sup>2</sup>
III	3 months	8.1±0.2 mm <sup>2</sup>
III	6 months	8.21±0.19 mm <sup>2</sup>
III	12 months	8.67±0.21 mm <sup>2</sup>

глазурованного шару, який маючи меншу поверхневу шорсткість, попереджує передчасне стирання оклюзійних поверхонь зубів-антагоністів.

Поєднання в 1-ій групі пластмаси та кераміки на оклюзійних поверхнях незнімних конструкцій показало найвищу динаміку приросту площі оклюзійних контактів - 9,93%. Причиною є низька твердість пластмаси та висока шорсткість її поверхні. Крім того, в цій групі спостерігалось нерівномірне стирання оклюзійних поверхонь, що призводить до перенавантаження тканин пародонта, та негативно впливає на час функціонування зубних протезів.

**Ключові слова:** ортопедичні конструкції, оклюзійні поверхні, акрилова пластмаса, кераміка.

*Ожоган З.Р., Бибен А.В.*

**Клинические аспекты сочетания керамических и пластмассовых окклюзионных поверхностей**

**Резюме.** Цель. Разработка и обоснование методик конструирования окклюзионных поверхностей в несъемных эстетических протезах путем сочетания различных конструкционных материалов.

**Материалы и методы**

Под нашим наблюдением находилось 65 пациентов, запро- тезированных несъемными эстетическими ортопедическими конструкциями с окклюзионными поверхностями из керамики и акриловых пластмасс.

1 группа: пациенты с сочетанием окклюзионных поверхностей несъемных протезов из керамики и пластмассы - 21 пациент;

2 группа: пациенты с сочетанием окклюзионных поверхностей из керамики - 22 пациентов;

3 группа: пациенты с сочетанием окклюзионных поверхностей из пластмассы - 22 пациентов.

Обследование пациентов проводили через 3,6 и 12 месяцев.

**Результаты.** Наибольший прирост площади окклюзионных контактов несъемных конструкций состоялся в 1 группе, то есть при сочетании зубных протезов с керамическими и пластиковыми окклюзионными поверхностями. Учтявая, что стирание происходит неравномерно, мы не рекомендуем сочетать различные материалы для облицовки окклюзионных поверхностей зубов-антагонистов.

**Выводы.** Проведенное исследование доказывает важную роль правильного сочетания материалов для облицовки окклюзионных поверхностей. Физико-химические характеристики материалов, а именно устойчивость к истиранию, играют значительную роль для длительного функционирования зубных протезов.

Исследование доказывает, что наименьший прирост площади окклюзионных контактов наблюдается во 2 группе, при сочетании керамических окклюзионных поверхностей. Причиной является хорошая устойчивость, по сравнению с пластмассой, керамики к истиранию, а также наличие глазированного слоя, имея меньшую поверхностную шероховатость, предупреждает преждевременное стирание окклюзионных поверхностей зубов-антагонистов.

Сочетание в первую группу пластмассы и керамики на окклюзионных поверхностях несъемных конструкций показало самую высокую динамику прироста площади окклюзионных контактов - 9,93%. Причиной является низкая твердость пластмассы и высокая шероховатость ее поверхности. Кроме того, в этой группе наблюдалось неравномерное стирание окклюзионных поверхностей ведет к перегрузке тканей пародонта, и негативно влияет на время функционирования зубных протезов.

**Ключевые слова:** ортопедические конструкции, окклюзионные поверхности, акриловая пластмасса, керамика.

Received: 29.11.2016

Revised: 6.03.2017

Accepted: 13.03.2017

DOI: 10.21802/gmj.2017.1.9

*Yu. Yu. Oliylyk, R.R. Slipetsky*

## Features of Histological Forms of Tumor Growth in Patients Who Underwent Combined Surgery for Stomach Cancer

Danylo Halysky Lviv National Medical University, Lviv, Ukraine

**Abstract.** The morphological type of tumor is a crucial factor in selecting the type and volume of surgery.

**The objective** of the research was to determine the effect of tumor histological type on survival rates in patients with locally advanced stomach cancer after combined surgery.

**Materials and methods.** The study included 990 patients; there were 714 men and 276 women. All patients underwent combined surgery: distal subtotal gastric resection was performed in 222 cases; proximal subtotal gastric resection was used in 129 cases; gastrectomy was applied in 639 cases. Statistical analysis of the obtained data was performed using the SPSS 13.0 software program. The results were considered statistically significant at  $p < 0.05$ .

**Results.** The study of certain morphological types of tumor depending on the patients' age and sex, as well as clinical and morphological features revealed a significant predominance of adenocarcinoma (77.1%) over other types and a significantly smaller number of undifferentiated tumors - 20.6%; squamous cell cancer and small-cell cancer constituted 1.3% and 1.0%, respectively. The average life expectancy after surgery was  $37.51 \pm 2.69$  months ( $p = 0.021$ ); in women, it was slightly higher compared to men -  $43.75 \pm 5.70$  months vs.  $35.13 \pm 3.02$  months ( $p = 0.057$ ). The overall 5-year survival rate for all patients was  $17.32 \pm 1.49\%$ ; for men -  $16.11 \pm 1.72\%$  ( $p = 0.005$ ), for women -  $20.46 \pm 2.99\%$  ( $p = 0.399$ ); however, these differences were not statistically significant ( $p = 0.087$ ).

**Conclusions.** After surgery, there were no significant differences in the average life expectancy of patients with the same histological

forms of gastric adenocarcinoma between men and women ( $p > 0.05$ ), while significant differences were observed between patients (both men and women) with adenocarcinoma and undifferentiated adenogenic stomach cancer ( $p < 0.05$ ).

**Keywords:** stomach cancer; histological forms; combined surgery.

### Problem statement and analysis of the recent research

Despite advances in early cancer detection, stomach cancer (SC) remains the leading cause of cancer death after lung cancer worldwide [4]. It is mainly due to the fact that a significant proportion of locally advanced forms of SC is diagnosed too late, especially in Ukraine (over 20-25%) [1].

Surgery which involves achieving a R0 resection, is often used in patients with locally advanced forms (T4) of SC [8]. Over recent years, the increase in the rate of complications in the postoperative period as well as survival rate has been actively discussed. Some researchers have reported minor changes in the survival of patients who underwent combined surgery [6]. However, significantly higher rates of complications and mortality as well as a slightly longer duration of in-patient treatment due to extended resections have been indicated by other authors [6].

The microscopic type of tumor is a crucial factor in selecting