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ANALYSIS OF DECEMENTATION OF FIXED ORTHOPEDIC STRUCTURES IN RESIDENTS OF THE ZAKARPATTIA REGION IN DYNAMICS

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Abstract. Introduction. The most common method of restoring dental defects is fixed orthopedic structures, their advantages are obvious: they restore the integrity of the dentition, aesthetics and its functioning. These structures include veneers, crowns, inlays and bridges. Constructions are made in a laboratory method and are fixed in the oral cavity on various cements, according to the indications of the manufacturing companies and ensure their functioning. However, a significant complication is decementing of the restorative structure. To determine effective methods of prevention of decementation, it is important to establish the prevalence of the aforementioned complication in the dynamics of observation.

Purpose of research: to analyze the occurrence of decementation of fixed orthopedic structures in the residents of the Transcarpathian region in the dynamics of observation.

Materials and methods. 720 patients of the “University Dental Polyclinic” LLC (Uzhhorod) with a history of dental defects restored in various ways were subject to analysis. Fixation of fixed orthopedic structures was carried out with Fuji Plus EWT (GC, Japan), which is a radiopaque reinforced glass ionomer cement for fixation with increased working time. The assessment of the quality of the functioning of the inlays after 3, 5 and 7 years was carried out according to the scale of the modified USPHS criteria. Dispensary examination of orthopedic structures was carried out 3, 5 and 7 years after their fixation.

The assessment of the state of the restorative fixed structure was carried out according to the following criteria:

1. Subjective evaluation by the patient, which included the patient's sensations, such as micromobility and vertical mobility of the structure, unpleasant smell, which increases when chewing, pain sensations.

2. Visual inspection of the structure, the presence of chips of the facing material, changes in bite, mobility of the structure, the presence of various forms of gingivitis (hypertrophic, fibrous).

3. X-ray diagnosis of the presence of root or crown caries, which are the support of a fixed orthopedic structure.

The distribution of decementations of various orthopedic structures during the specified observation periods was as follows: after 3 years, 4.3% - 27 decementations were diagnosed, after 5 years - 7.5% - 47, and after 7 years - 10.8% - 68 decementations.

Statistical calculations were performed on a personal computer using the licensed programs “MSExcел7” for the operating system “Windows” and the standard program package “STATISTICA” v. 6.0.

Conclusions. The sum of the average values of the Alpha (A) and Bravo (B) scores, registered during the analysis of the researched criteria, during the verification of the state of the tabs after 5 years of their operation, corresponded to the level of successful functioning; the survival rate of tabs after 5 years of operation decreased to 85.7% according to the Alpha (A) criterion compared to 93.7%, and Bravo (B) - 10.9% compared to 5.4%. When comparing the percentage ratio of decementation of various types of fixed orthopedic structures in the dynamics of observation, it was established that metal-ceramic bridge prostheses were most often decemented, namely: after 3 years in 4.7% - 14 cases, after 5 years in 7.7% - 23 cases, after 7 years in 10.7% - 32 cases. In addition, the percentage of decementation of all-ceramic bridge prostheses probably increased over time (6.2%; 12.3%; 18.5%; $p < 0.05$). The survival rate of tabs after 7 years of operation decreased to 72.5% compared to 85.7% after 5 years and 93.7% after 3 years, but the result of operation corresponded to the level of successful functioning.

Keywords: dentition defects, fixed orthopedic structures, crowns, metal-ceramic crowns, metal-ceramic bridge prostheses, all-ceramic crowns, all-ceramic bridge prostheses, prevalence, cementation, cements for fixation of fixed structures.

Introduction and justification of the research.

Since the presence of dentition defects in patients over 40 years old reaches 100%, a large number of scientific studies are devoted to their restoration. [1, 2]. The most common method of restorative treatment is fixed orthopedic structures, their advantages are obvious: they restore the integrity of the dentition, aesthetics and its functioning. [3, 4, 5]. These structures include veneers, crowns, inlays, and bridges. [6, 7]. Constructions are made in a laboratory method and are fixed in the oral cavity on various cements, according to the indications of the manufacturing companies and ensure their functioning.

However, a significant complication is decementing the restorative structure. To determine effective methods of prevention of decementation, it is important to establish the prevalence of the aforementioned complication in the dynamics of observation.

The purpose is to analyze the occurrence of decementation of fixed orthopedic structures in the residents of Zakarpattia region in the dynamics of observation.

Materials and methods. 720 patients of the Orthopedic Department of the “University Dental Polyclinic” LLC (Uzhhorod) who live in the Zakarpattia region and have a history of examined dental defects restored in various ways were subject to analysis. The laboratory stages

of manufacturing non-removable orthopedic structures were carried out in the dental laboratory of the aforementioned medical institution in compliance with all requirements and work algorithms with prior calibration of the stages by all dental technicians.

The evaluation of the quality of the functioning of the tabs after 3, 5 and 7 years was carried out according to the scale of the modified USPHS criteria with a detailed study of such parameters as the anatomical form of the restoration, marginal adaptation of the material, secondary caries, changes in the color of the cavity edges, retention of the restoration, gingival inflammation. [7, 8].

Dispensary examination of orthopedic structures was carried out 3, 5 and 7 years after their fixation.

Statistical calculations were performed on a personal computer using the licensed programs "MSExcel7" for the operating system "Windows" and the standard program package "STATISTICA" v. 6.0. [9, 10].

Research results and their discussion. Fixation of fixed orthopedic structures was carried out with Fuji Plus EWT (GC, Japan), which is a radiopaque reinforced glass ionomer cement for fixation with increased working time. The technique of cement preparation and fixation of structures corresponded to the recommendations of the manufacturer and included:

1. Preparation for mixing: The standard powder/liquid ratio is 2.0g/1.0g, i.e. one large scoop of powder and three drops of liquid or one small scoop of powder and one drop of liquid.

2. Mixing: apply the appropriate amount of liquid and powder to the mixing paper, immediately adding all the powder to the liquid and quickly mixing with a plastic spatula for 20 seconds. When mixing a large amount of material, the powder is divided into two equal parts, the first portion is mixed with all the liquid for 15 seconds, then the rest of the powder is added and the entire material is thoroughly mixed for 15-25 seconds. (total time 30-40 seconds).

3. Fixation technique: after preparing the tooth according to the traditional method, depending on the type of structure, we clean the prepared tooth only with pumice stone and water. To achieve the best adhesion, we apply Fuji Plus conditioner (GC, Japan) for 20 seconds. (contains 2% ferric chloride solution) then rinse the tooth thoroughly with water. We remove excess moisture by wetting with a cotton swab, or dry with air without oil impurities under low pressure. (avoid overdrying). The surface of the tooth should look wet (shiny). If necessary, we use materials based on calcium hydroxide to cover the pulp.

We clean and dry the inner surface of the casting. We mix the required amount of cement. We apply a layer of cement of sufficient thickness (40µm) on the inner surface of the restoration and set it in place. Working time is 3 minutes and 30 seconds from the beginning of kneading (at a temperature of 23°C). A higher temperature will reduce the working time. Throughout the hardening time, the pressing force should be moderate. Remove excess cement when the material becomes rubber-like in consistency. We start the final processing no earlier than in 5 minutes 45 seconds after installing the orthopedic structure. [5, 6].

Dispensary supervision of the functioning of fixed orthopedic structures was carried out 3, 5 and 7 years after their installation.

The criteria for excluding the assessment of the quality of fixation were:

1. The quality of the fixing cement (only Fuji Plus EWT (GC, Japan) was used).

2. Compliance with the protocol of clinical and laboratory stages of manufacturing restorative fixed structures.

3. Presence of pronounced forms of bruxism in patients.

4. The presence of progressive aggressive forms of generalized periodontitis.

5. Presence of complicated allergic status

6. The presence of general somatic pathologies, which are absolute contraindications to dental treatment (acute heart attack, stroke, acute infectious diseases, etc.).

The assessment of the state of the restorative fixed structure was carried out according to the following criteria:

1. Subjective evaluation by the patient, which included the patient's sensations, such as micromobility and vertical mobility of the structure, unpleasant smell, which increases when chewing, pain sensations.

2. Visual inspection of the structure, the presence of chips of the facing material, changes in bite, mobility of the structure, the presence of various forms of gingivitis (hypertrophic, fibrous).

3. X-ray diagnosis of the presence of root or crown caries, which are the support of a fixed orthopedic structure.

The distribution of decementations of various orthopedic structures during the specified observation periods was as follows: after 3 years, 4.3% - 27 decementations were diagnosed, after 5 years - 7.5% - 47, and after 7 years - 10.8% - 68 decementations (Table 1.).

When analyzing non-removable orthopedic structures, it was established that cementation of metal-ceramic crowns was recorded after 3 years in 3.1% - 5 cases, after 5 years in 5.6% - 9 cases, after 7 years in 9.4% - 15 cases. (Fig. 1).

Decementation of metal-ceramic bridge prostheses was diagnosed after 3 years in 4.7% - 14 cases, after 5 years in 7.7% - 23 cases, after 7 years in 10.7% - 32 cases. All-ceramic crowns were decemented after 3 years in 3.8% - 4 cases, after 5 years in 6.7% - 7 cases, after 7 years in 8.6% - 9 cases; all-ceramic bridge prostheses were decemented after 3 years in 6.2% - 4 cases, after 5 years in 12.3% - 8 cases, after 7 years in 18.5% - 12 cases.

As a result of data processing, 3 years after the fixation of 90 tabs, it was established that the overall level of success of their functioning, estimated as the average indicators of Alpha (A) of the studied sample, reached 93.7%, and Bravo (B) - 5.4%; Charlie indicators (C) and were associated with the same structures, their analysis revealed 3 actually problematic restorations, which is 3.3%; Delta (D) indicators were not noted. (Table 2).

Table 1.

Distribution of decementation of various orthopedic structures in the dynamics of observation.

Terms of observation	After 3 years		After 5 years		After 7 years	
	Abs.	%	Abs.	%	Abs.	%
Construction types						
Metal-ceramic crowns (n=160)	5	3,1	9	5,6	15	9,4
Bridge-like metal-ceramic dentures (n=300)	14	4,7	23	7,7	32	10,7
All-ceramic crowns (n=105)	4	3,8	7	6,7	9	8,6
Bridge-like all-ceramic dentures (n=65)	4	6,2	8	12,3	12	18,5
Total (n=630)	27	4,3	47	7,5	68	10,8

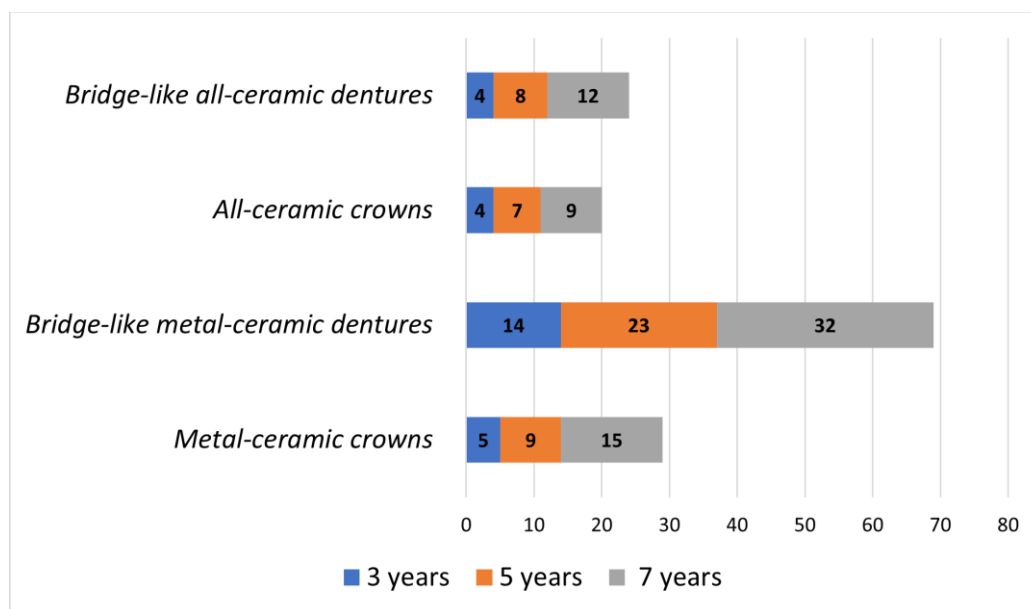


Fig. 1. Distribution of the amount of decementation of fixed orthopedic structures in the dynamics of observation.

Table 2

Distribution of Ryge/USPHS criteria for restoration of inlays defects after 3 years, %.

Ryge/USPHS критерії	Alpha (A), %	Bravo (B), %	Charlie (C), %	Delta (D), %
Anatomical form	97,7	2,2	0,1	0
Marginal adaptation	91,1	6,6	2,3	0
Marginal discoloration	87,8	8,9	3,3	-
Secondary caries	96,7	3,3	0	-
Gingivitis	91,1	7,8	1,1	-
Occlusal contact	95,4	3,3	1,1	-
Retention	95,4	4,6	0	-

The Alpha (A) grade was set at 97.7% according to the criterion of anatomical form, at 96.7% – secondary caries; in 95.4% of cases – occlusal contact and retention; in 91.1% – marginal adaptation and inflammation of the gums; in 87.8% of cases – marginal discoloration. The grade Bravo (B) is determined in 8.9% by the criterion of marginal discoloration; in 7.8% – inflammation of the gums; in 6.6% – marginal adaptation; in 4.6% – retention; 3.3% each – occlusal contact and secondary caries; and in 2.2% – anatomical form. The Charlie grade (C) was determined in 3.3% of cases by the criterion of marginal discoloration; in 2.3% - marginal adaptation; 1.1% each – gum inflammation and occlusal contact. The Delta (D) score was not determined.

The percentage distribution of the criterion evaluation of the quality of tabs after 5 years is shown in Table 3.

During the examination after 5 years, a probable increase was established relative to the indicators after 3 years of the percentage of Charlie criteria (C), in particular, the anatomical form (0.1%; 3.3%; $p < 0.05$); marginal adaptation (2.3%; 4.4%; $p < 0.05$); marginal discoloration (3.3%; 6.7%; $p < 0.05$); secondary caries (0%; 1.1%; $p < 0.05$); inflammation of the gums (1.1%; 2.2%; $p < 0.05$); retention (0%; 2.2%; $p < 0.05$). According to the marginal adaptation criterion, the prevalence percentages according to the Delta (D) criterion probably increased (0%; 2.2%; $p < 0.05$).

Table 3

Distribution of Ryge/USPHS criteria for restored defect inlays after 5 years.

Ryge/USPHS criteria	Alpha (A), %	Bravo (B), %	Charlie (C), %	Delta (D), %
Anatomical form	90,0	6,7*	3,3*	0
Marginal adaptation	81,2*	12,2*	4,4*	2,2
Marginal discoloration	73,3*	20,0*	6,7*	-
Secondary caries	91,1*	7,8*	1,1*	-
Gingivitis	84,5*	13,3*	2,2*	-
Occlusal contact	92,2	6,7*	1,1	-
Retention	87,8*	10,0*	2,2*	-

Notes: * – the probability between indicators after 3 years ($p < 0.05$).

The percentages of the prevalence of the Bravo (B) score probably increased, in particular, according to the anatomical form criterion (2.2%; 6.7%; $p < 0.05$); marginal adaptation (6.6%; 12.2%; $p < 0.05$); marginal discoloration (8.9%; 20.0%; $p < 0.05$); secondary caries (3.3%; 7.8%; $p < 0.05$); gum inflammation (7.8%; 13.3%; $p < 0.05$); occlusal contact (3.3%; 6.7%; $p < 0.05$); retention (4.6%; 10.0%; $p < 0.05$).

After 5 years, relative to the indicators after 3 years, the prevalence of the Alpha (A) score decreased, namely: according to the anatomical form criterion (97.7%; 90.0%; $p > 0.05$); marginal adaptation (91.1%; 81.2%; $p < 0.05$); marginal discoloration (87.8%; 73.3%; $p < 0.05$); secondary caries (96.7%; 91.1%; $p < 0.05$); gum

inflammation (91.1%; 84.5%; $p < 0.05$); occlusal contact (95.4%; 92.2%; $p > 0.05$); retention (95.4%; 87.8%; $p < 0.05$).

The sum of the average values of the Alpha (A) and Bravo (B) scores, registered during the analysis of the researched criteria, during the verification of the state of the tabs after 5 years of their operation, corresponded to the level of successful functioning; the survival rate of tabs after 5 years of operation decreased to 85.7% according to the Alpha (A) criterion compared to 93.7%, and Bravo (B) - 10.9% compared to 5.4%.

The results of the evaluation of the operation of the tabs after 7 years are shown in Table 4.

Table 4

Distribution of Ryge/USPHS criteria for restored defect inlays after 7 years.

Ryge/USPHS criteria	Alpha (A), %	Bravo (B), %	Charlie (C), %	Delta (D), %
Anatomical form	77,8 ^o *	12,2 ^o *	6,7 ^o *	3,3 ^o *
Marginal adaptation	64,4 ^o *	16,7 ^o	12,2 ^o *	6,7 ^o *
Marginal discoloration	55,5 ^o *	27,8 ^o *	16,7 ^o *	-
Secondary caries	70,0 ^o *	20,0 ^o *	10,0 ^o *	-
Gingivitis	76,7 ^o *	18,9 ^o	4,4 ^o *	-
Occlusal contact	84,5 ^o *	12,2 ^o *	3,3 ^o *	-
Retention	78,9 ^o	16,7 ^o *	4,4 ^o *	-

Notes: ^o – the probability between indicators after 3 years ($p < 0.05$); * – probability between indicators after 5 years ($p < 0.05$).

After 7 years, relative to indicators after 3 and 5 years, the prevalence of the Alpha (A) score decreased, namely: according to the anatomical form criterion (97.7%; 90.0%; 77.8%; $p < 0.05$); marginal adaptation (91.1%; 81.2%; 64.4%; $p < 0.05$); marginal discoloration (87.8%; 73.3%; 55.5%; $p < 0.05$); secondary caries (96.7%; 91.1%; 70.0%; $p < 0.05$); gum inflammation (91.1%; 84.5%; 76.7%; $p < 0.05$); occlusal contact (95.4%; 92.2%; 84.5%; $p < 0.05$); retention (95.4%; 87.8%; 78.9%; $p < 0.05$). (Fig. 2).

The survival rate of inlays after 7 years of operation decreased to 72.5% compared to 85.7% after 5 years and 93.7% after 3 years, but the result of operation corresponded to the level of successful functioning.

The percentages of prevalence of the Bravo (B) score probably increased, in particular, according to the anatomical form criterion (2.2%; 6.7%; 12.2%; $p < 0.05$); marginal adaptation (6.6%; 12.2%; 16.7%; $p < 0.05$);

marginal discoloration (8.9%; 20.0%; 27.8%; $p < 0.05$); secondary caries (3.3%; 7.8%; 20.0%; $p < 0.05$); gum inflammation (7.8%; 13.3%; 18.9%; $p < 0.05$); occlusal contact (3.3%; 6.7%; 12.2%; $p < 0.05$); retention (4.6%; 10.0%; 16.7%; $p < 0.05$). (Fig. 3).

The percentages of Charlie criteria (C), in particular anatomical form, increased (0.1%; 3.3%; 6.7%; $p < 0.05$); marginal adaptation (2.3%; 4.4%; 12.2%; $p < 0.05$); marginal discoloration (3.3%; 6.7%; 16.7%; $p < 0.05$); secondary caries (0%; 1.1%; 10.0%; $p < 0.05$); gum inflammation (1.1%; 2.2%; 4.4%; $p < 0.05$); occlusal contact (1.1%; 1.1%; 3.3%; $p < 0.05$); retention (0%; 2.2%; 3.3%; $p < 0.05$). The prevalence percentages according to the Delta (D) criterion in the cluster anatomic form (0%; 0%; 3.3%; $p < 0.05$) and marginal adaptation (0%; 2.2%; 6.7%; p) probably increased ($p < 0.05$). (Fig. 4).

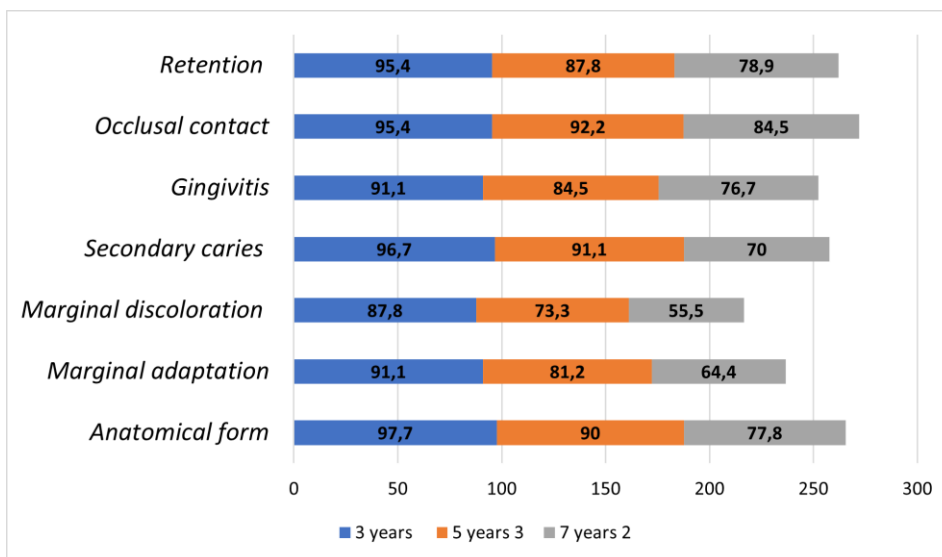


Fig. 2. Changes in the distribution of the Alpha (A) level assessment during the 7-year monitoring period.

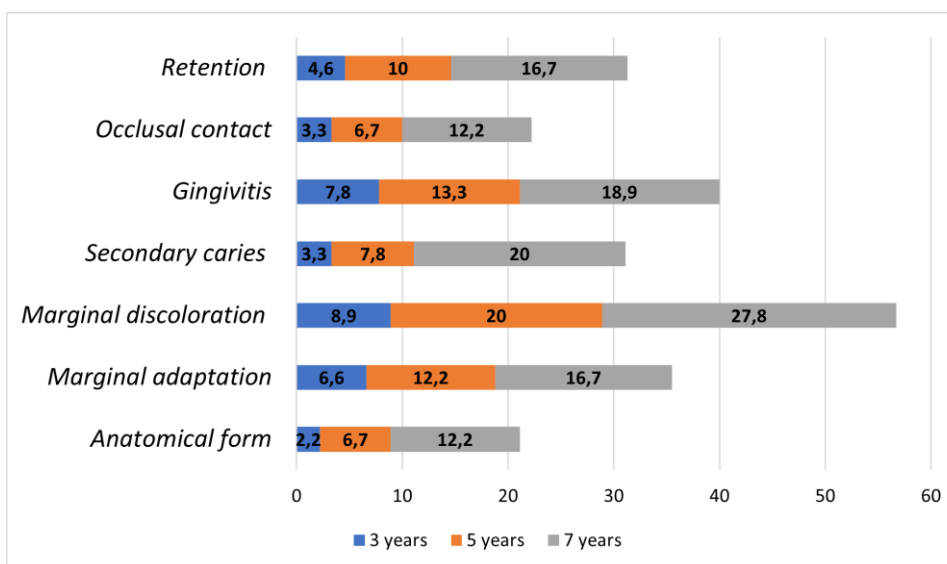


Fig. 3. Changes in the Bravo (B) grade distribution during the 7-year monitoring period.

Discussion. The modern and most common method of restoring the integrity of the tooth rows is fixed orthopedic constructions. De-cementing of non-removable orthopedic structures is a significant complication that leads to the replacement of the structure in part or in full. To assess the stability of a fixed structure, one should start with a subjective assessment by the patient, in which the patient's sensations are noted, for example, micromobility or vertical mobility of the structure, as well as an unpleasant smell that increases when chewing, pain sensations.

An examination by a dentist is important, with a visual assessment of the structure, an assessment of the presence of chips of the facing material, changes in the bite, the presence of mobility of the structure, as well as inflammation of the gums. X-ray diagnosis of the presence of root or crown caries, which are the support of a fixed orthopedic structure.

Conclusions. When comparing the percentage ratio of decementation of various types of fixed orthopedic structures in the dynamics of observation, it was established that metal-ceramic bridge prostheses were most often decemented, namely: after 3 years in 4.7% - 14 cases,

after 5 years in 7.7% - 23 cases, after 7 years in 10.7% - 32 cases. In addition, the percentage of decementation of all-ceramic bridge prostheses probably increased over time (6.2%; 12.3%; 18.5%; $p < 0.05$). The survival rate of tabs after 7 years of operation decreased to 72.5% compared to 85.7% after 5 years and 93.7% after 3 years, but the result of operation corresponded to the level of successful functioning.

Prospects for further researches. Establishing the prevalence of decementation of various types of fixed orthopedic structures in the residents of the Zakarpattia region in the dynamics of observation will further allow to single out the etiological factors and criteria for their appearance and to establish an algorithm for the examination of patients in the dynamics in order to detect complications in the early stages.

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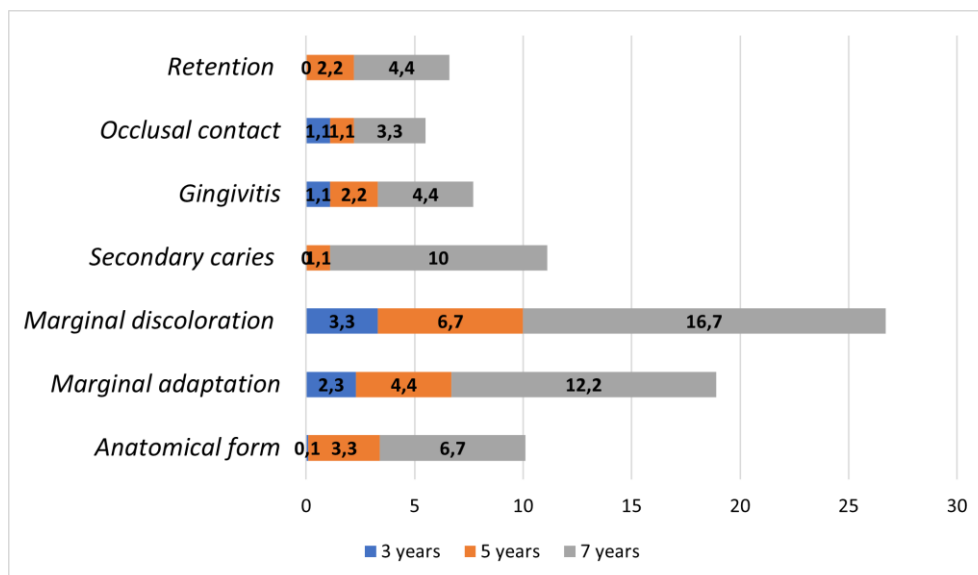


Fig. 4. Changes in the distribution of the Charlie level assessment (C) during the 7-year monitoring period.

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АНАЛІЗ РОЗЦЕМЕНТУВАНЬ НЕЗНІМНИХ ОРТОПЕДИЧНИХ КОНСТРУКЦІЙ У МЕШКАНЦІВ ЗАКАРПАТСЬКОЇ ОБЛАСТІ В ДИНАМІЦІ

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Резюме. Вступ. Найбільш поширеним методом відновлення дефектів зубних рядів є незнімні ортопедичні конструкції, їх переваги очевидні: відновлюють цілісність зубного ряду, естетику та його функціонування. Серед таких конструкцій вініри, коронки, вкладки та мостоподібні протези.

Конструкції виготовляють лабораторним способом та фіксуються в порожнині рота на різні цементи, згідно показів фірм-виробників та забезпечують їх функціонування. Проте, суттєвим ускладненням є розцементування відновлювальної конструкції. Для визначення ефективних методів профілактики розцементувань, важливим є встановлення поширеності вищезгаданого ускладнення в динаміці спостереження.

Мета дослідження. Проаналізувати виникнення розцементувань незнімних ортопедичних конструкцій у мешканців Закарпатської області в динаміці спостереження.

Матеріали і методи. Аналізу підлягали 720 пацієнтів ТОВ «Університетська стоматологічна поліклініка» (м. Ужгород), в анамнезі у обстежених дефекти зубних рядів, відновлені різними способами. Оцінка якості функціонування вкладок через 3, 5 та 7 років проводилася за шкалою модифікованих критеріїв USPHS. Диспансерний огляд ортопедичних конструкцій здійснювали через 3, 5 та 7 років після їх фіксації. Статистичні обчислення проводилися на персональному комп'ютері з використанням ліцензованих

програм "MSExcel7" для операційної системи "Windows" та стандартного пакету програм «STATISTICA» v. 6.0.

Висновки. При порівнянні відсоткового співвідношення розцементувань різних видів незнімних ортопедичних конструкцій в динаміці спостереження встановлено, що найчастіше підлягали розцементуванню металокерамічні мостоподібні протези, а саме: через 3 роки у 4,7% - 14 випадках, через 5 років у 7,7% - 23 випадках, через 7 років у 10,7% - 32 випадках. Окрім того, з часом вірогідно зріс відсоток розцементувань суцільнокерамічних мостоподібних протезів (6,2%; 12,3%; 18,5%; $p < 0,05$). Рівень виживання вкладок через 7 років експлуатації знизився до 72,5% відносно 85,7% через 5 років та 93,7% через 3 роки, проте результат експлуатації відповідав рівню успішного функціонування.

Ключові слова: дефекти зубних рядів, незнімні ортопедичні конструкції, металокерамічні коронки, мостоподібні металокерамічні протези, суцільнокерамічні коронки, суцільнокерамічні мостоподібні протези, поширеність, розцементування, цементу для фіксації незнімних конструкцій.

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