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Analysis of reasons for visit in completely edentulous patients requiring repeat prosthetic rehabilitation

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ABSTRACT

BACKGROUND: Complete laminar dentures are currently the most common prosthetic rehabilitation approach in completely edentulous patients. However, acrylic resin, the primary structural material used in these dentures, has certain well-known disadvantages. Identifying the primary reasons for visit in patients requiring replacement of acrylic complete laminar dentures will help determine the best course of action for improving this type of prosthetic rehabilitation.

AIM: To assess the reasons for visit in patients requiring replacement of complete laminar dentures.

MATERIALS AND METHODS: Between 2021 and 2022, a comprehensive dental examination was performed in completely edentulous patients who had previously used complete laminar dentures and needed to replace them. The primary factors determining the need for replacement dentures of this type were identified, and their frequency during specific time periods was assessed. The risk of functional defects, mechanical failures, and poor esthetic condition was calculated. Nonparametric analysis (chi-squared test) was used to assess statistical differences between the parameters. The frequency of a specific reason for visit was assessed using relative risk (RR) with a 95% confidence interval (CI).

RESULTS: Mechanical failure was the main reason for visit (63.3%) in completely edentulous patients requiring replacement of complete laminar dentures within three years after the dentures were manufactured. After three years of wearing these dentures, the risk of mechanical failure and functional defects significantly increases by 1.8 times (RR=1.4; 95% CI: 0.9–1.9) and 1.6 times (RR=1.6; 95% CI: 1.1–2.6), respectively (p <0.05), with approximately equal frequency (47.8% and 43.7%, respectively). When wearing these dentures for more than six years, visits due to functional defects become the most common (58.3%).

CONCLUSION: The service life of complete laminar dentures is directly associated with the reasons for visit for their replacement. The increased risk of functional defects, such as impaired fixation and stabilization, necessitates developing a set of measures for the prevention of maxillary ridge and mandibular alveolar bone atrophy, as well as dystrophic changes of the mucosa in the denture-supporting area.

Keywords: complete laminar dentures; repeat prosthetic rehabilitation; removable dentures.

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Анализ причин обращения пациентов с полным отсутствием зубов с целью повторного протезирования

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АННОТАЦИЯ

Обоснование. На сегодняшний день применение полных съёмных пластиночных протезов является наиболее распространённым видом восполнения полного отсутствия зубов. Однако основной конструкционный материал таких протезов акрил не лишён общеизвестных недостатков. Выявление основных причин обращения с целью замены полных съёмных пластиночных протезов из акрила позволит найти наиболее актуальное направление для улучшения данного вида протезирования.

Цель исследования — оценка причин обращения пациентов с целью замены полных съёмных пластиночных протезов.

Материалы и методы. За период с 2021 по 2022 год проводилось комплексное стоматологическое обследование пациентов с полным отсутствием зубов, ранее эксплуатировавших полные съёмные пластиночные протезы и обратившихся с целью их замены. Выявляли основные факторы необходимости изготовления нового протеза данного вида и частоту их возникновения в конкретные временны́е периоды. Рассчитывали риск возникновения функциональных недостатков, механических поломок и неудовлетворительного эстетического состояния. Статистические различия между показателями оценивали с помощью непараметрического метода анализа (критерий χ^2). С целью оценки риска возникновения той или иной причины обращения рассчитывали относительный риск (relative risk, RR) при доверительном интервале (confidence interval, CI) 95%.

Результаты. Основной причиной обращения пациентов с полным отсутствием зубов с целью замены ранее изготовленного полного съёмного пластиночного протеза в сроки до трёх лет является механическая поломка (63,3%). При этом спустя три года эксплуатации стоматологической конструкции данного вида риск возникновения механических поломок и функциональных недостатков статистически значимо увеличивается в 1,8 (RR=1,4; 95% CI: 0,9–1,9) и 1,6 (RR=1,6; 95% CI: 1,1–2,6) раза соответственно (p <0,05), а частота встречаемости практически выравнивается — 47,8 и 43,7% соответственно. При использовании протезов более шести лет в процентном соотношении (58,3%) начинает доминировать обращаемость, связанная с функциональной недостаточностью.

Заключение. Срок эксплуатации полных съёмных пластиночных протезов напрямую связан с причинами обращения с целью замены стоматологической конструкции. Возрастающий риск возникновения функциональных недостатков в виде нарушения фиксации и стабилизации диктует необходимость разработки комплекса мероприятий по профилактике развития атрофических процессов костной ткани альвеолярного отростка верхней челюсти и альвеолярной части нижней челюсти, а также дистрофических изменений слизистой оболочки протезного ложа.

Ключевые слова: полные съёмные пластиночные протезы; повторное протезирование; съёмное протезирование.

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BACKGROUND

Missing teeth are directly associated with the age of patients and are among the most prevalent age-related conditions. As a result, the prevalence and severity of this disorder increase predictably among elderly and senile individuals [1–3]. Modern dentistry offers a wide range of orthopedic treatment approaches for edentulous patients, including dental implantation. However, dental restoration by implantation is not always possible due to various factors, such as decompensated systemic diseases, significant financial burden, and others [4]. Thus, removable dentures, including complete dentures, remain a viable option.

Acrylic complete laminar dentures are currently the most common prosthetic rehabilitation approach in completely edentulous patients. However, the primary structural material used in these dentures has certain well-known disadvantages [5, 6]. Identifying the primary reasons for visit in patients requiring replacement of acrylic complete laminar dentures will help determine the best course of action for improving this type of prosthetic rehabilitation.

STUDY AIM: To assess the reasons for visit in patients requiring replacement of complete laminar dentures.

MATERIALS AND METHODS

A statistical assessment of the frequency of reasons for visit in patients requiring replacement of complete laminar dentures was performed.

Study design

- observational,
- single-center,
- cross-sectional,
- sampling,
- single-arm.

Eligibility criteria

The study included completely edentulous patients (ICD code: K08.1) wearing complete laminar dentures for 0 to ≥6 years.

Study setting

The study was performed at the City Dental Clinic (Perm Territory).

Study duration

The study duration was 22 months (February 3, 2021, to December 23, 2022). During the study, a comprehensive dental examination in completely edentulous patients (ICD code: K08.1) was performed, and the reasons for replacement of complete laminar dentures were documented.

Therapeutic intervention

During the period specified above, a comprehensive dental examination was performed in completely edentulous patients who had previously used complete laminar dentures and needed to replace them.

Primary study outcome

The frequency of reasons for visit in patients requiring replacement of complete laminar dentures.

Secondary study outcomes

Documenting and analyzing the reasons for complete laminar denture replacement after short-term and long-term use. Risk calculation for functional defects, mechanical failures, and unsatisfactory esthetic results.

Subgroup analysis

The patient were divided into three groups based on the duration of use of complete laminar dentures: <3 years, 30 patients (21.9%); 3–6 years, 71 patients (51.8%); and >6 years, 36 patients (26.3%).

Reporting outcomes

The primary and secondary study outcomes were presented using statistical analysis.

Ethical review

The clinical study was approved at the meeting of the Local Ethics Committee of the E.A. Vagner Perm State Medical University (protocol No. 9 of September 30, 2021).

Statistical analysis

Sample size calculation: The study sample size was calculated according to the formula: $n=t^2 \times p(1-p)/m^2$, where n is the sample size; t is the accuracy level; for a 95% confidence interval (CI), t=1.96; p is the estimated prevalence of assessed event (at 50%, p=0.5); m is the acceptable error, 5% [7]. If the need for complete denture replacement is 9.4%, the sample size is 131 patient [8].

Statistical analysis methods: Nonparametric analysis (χ^2 test) was used to assess differences between parameters. Relative risk (RR) and CI limits were calculated in order to assess the risk for a specific reason for denture replacement.

RESULTS

Study subjects

The study included 137 patients aged 60–74 years (older age according to the World Health Organization classification; 55 females and 82 males) who presented to the study site for the replacement of complete laminar dentures.

Primary results

A total of 220 completely edentulous patients were examined; of these:

- 8.6% (19 patients; 12 males and 7 females) presented for the first time for the manufacturing of complete laminar dentures for both jaws;
- 29.1% (64 patients; 7 males and 57 females) presented for the manufacturing of a complete laminar denture for one jaw (these patient previously wore a removable partial laminar denture);
- 35.9% (79 patients; 43 males and 36 females) presented for the replacement of a complete laminar denture for one jaw;
- 26.4% (58 patients; 39 males and 19 females) presented for the replacement of complete laminar dentures for both jaws.

Thus, 137 of the 220 examined patients (55 females and 82 males) have previously used complete dentures for both jaws (Table 1).

The reasons for replacing dentures were as follows:

- Mechanical failure: cracks, chipping, fractures;
- Functional defects (impaired fixation and/or stabilization of dentures, etc.);
- Unsatisfactory esthetic results with complete laminar dentures: attrition of cutting edges of anterior teeth and masticatory surfaces of lateral teeth; color changes in the polymer material of the denture basis and artificial teeth; initial dissatisfaction with the selected color or shape of artificial teeth; denture odor, etc. (Fig. 1).

The reasons for replacement of removable dentures specified above were associated with the duration of their use (Table 1).

The use of dentures for more than three years was associated with a significant increase in functional defects, including occlusal surface deformation of artificial teeth (attrition), which caused complaints of discomfort when eating due to prolonged chewing (Fig. 2), as well as impaired fixation and stabilization of complete laminar dentures. Notably, the frequency of visits for replacement of dentures due to unsatisfactory esthetic results significantly decreased in both males and females after 6 years of use.

Secondary results

The relative risk of functional defects increased by 1.6 times when using dentures for 3–6 years (RR=1.6; 95% CI: 1.1–2.6) and by 2.2 times after 6 years, compared to using them for <3 years (RR=2.2; 95% CI: 1.1–4.2). The relative risk of mechanical failures increased significantly by 1.8 times when using dentures for 3 years (RR=1.4; 95% CI: 0.9–1.9), compared to a more prolonged use (3–6 years). Removable dentures did not have a higher risk of mechanical failure after 6 years of use compared to <3 years. These findings indicate an increased risk of mechanical failure when using dentures for 3–6 years (Fig. 3).

Adverse events

No adverse events were reported in the study.

DISCUSSION

Summary of primary study results

Mechanical failures were the most common reason for replacement of complete laminar dentures in completely edentulous patients who used them for <3 years (63.3%). After three years of using these dentures, the risk of mechanical and functional

Table 1. Reasons for denture replacement in patients with completely edentulous upper and/or lower jaw, *n*/%

Reasons	Duration of use					
	<3 years, 30/21.9		3–6 years, 71/51.8		>6 years, 36/26.3	
	F	M	F	M	F	M
Mechanical failure	19/63.3		34/47.8		14/38.9	
	5/26.3	14/73.7	8/23.5	26/76.5	2/14.3	12/85.7
Functional defects	8/26.7		31/43.7		21/58.3*	
	4/50.0	4/50.0	20/64.5	11/35.5	7/33.3	14/66.7
Unsatisfactory esthetic results	3/10.0		6/8.5		1/2.8*#	
	3/100	0	5/83.3	1/16.7	1/100	0

* p <0.05 compared to the same parameter when used for <3 years; # p < 0.05 compared to the same parameter when used for 3–6 years. The χ^2 test was used for statistical analysis.

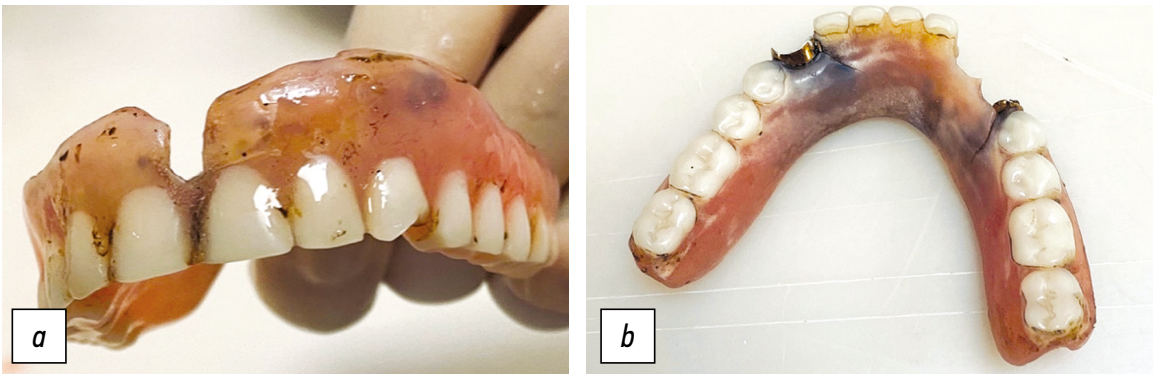

Fig. 1. Complete laminar denture for the upper jaw (a) and complete laminar denture for the lower jaw (b), patient N. (female, 69 years, K08.1). Poor hygiene, esthetic results, and performance characteristics of the denture (pigmented plaque, chipping, attrition of artificial teeth); duration of use: 14 years.

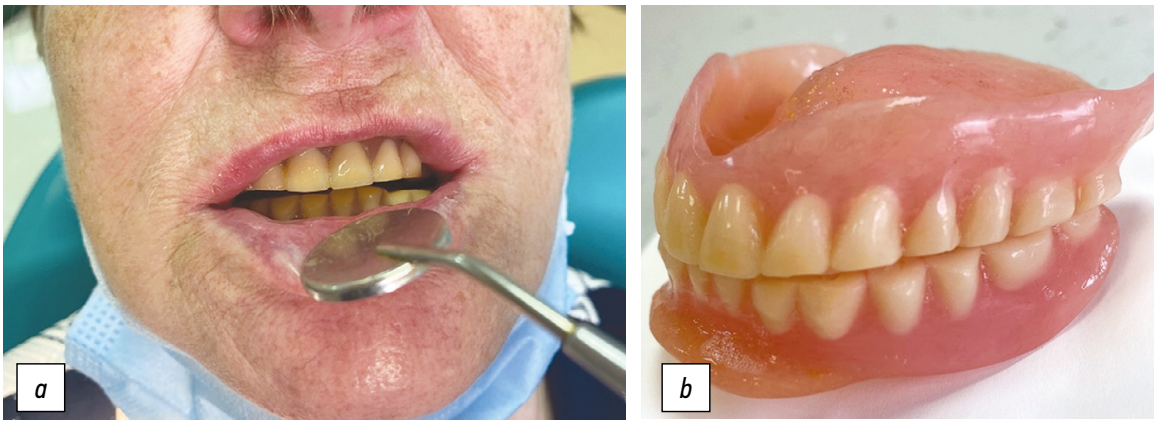

Fig. 2. Patient N. (female, 69 years, K08.1): *a*, complete laminar dentures used for 5 years; *b*, complete laminar dentures for the upper and lower jaw used by the patient.

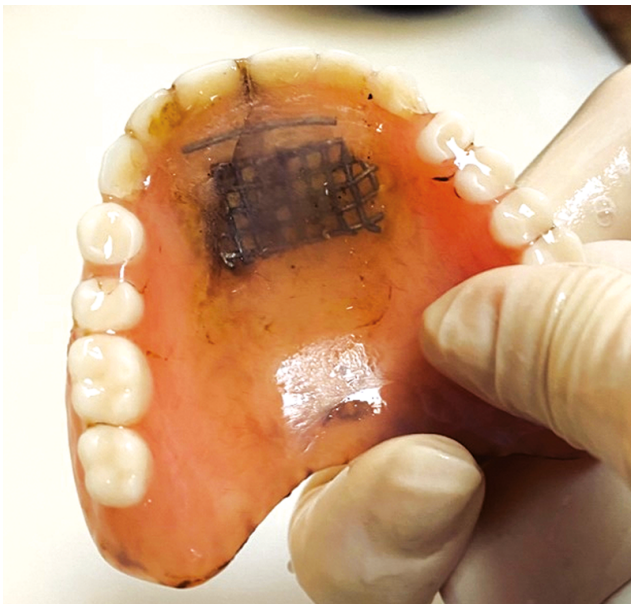

Fig. 3. Complete laminar denture, patient V. (male, 72 years, K08.1). Poor denture hygiene, multiple repairs due to mechanical failures, attrition of occlusal surfaces of artificial teeth; duration of use: 7 years.

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defects increases significantly (by 1.8 times and 1.6 times, respectively), and the incidence becomes comparable (47.8% and 43.7%, respectively). When using dentures for >6 years, functional defects become the most common reason for replacement (58.3%). Discussion of primary study results

An increase in functional defects of complete laminar dentures can be associated with maxillary ridge and mandibular alveolar bone atrophy, as well as hypotrophic and dystrophic changes of the mucosa in the denture-supporting area [9]. Several factors contribute to the progression of these disorders, including age-related degradation of compensatory mechanisms of the human body, as well as non-physiological masticating pressure propagation to denture-supporting area tissues, which is the main drawback of complete dentures [10].

On the other hand, the high proportion of mechanical failures of complete laminar dentures used for <3 years may reflect production faults [11, 12].

Study limitations

The main limitation of this study is the inability to assess errors made by dental technicians and orthodontists during various stages of manufacturing of complete laminar dentures, which resulted in their breakage or degradation of performance characteristics.

CONCLUSION

The duration of use of complete laminar dentures is directly related to the reasons for their replacement. The increased risk of functional defects, such as impaired fixation and stabilization, necessitates developing a set of measures for the prevention of maxillary ridge and mandibular alveolar bone atrophy, as well as dystrophic changes of the mucosa in the denture-supporting area.

ADDITIONAL INFORMATION

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Competing interests. The authors declare that they have no competing interests.

Authors' contribution. O.A. Shuliatnikova — oversaw the project, designed the study, analyzed data, wrote the manuscript with input from all authors; A.P. Godovalov — designed the study, analyzed data, wrote the manuscript with input from all authors; M.V. Yakovlev — examination of patients, designed the study, analyzed data, wrote the manuscript with input from all authors. All authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

Consent for publication. Written consent was obtained from the patients for publication of relevant medical information and all of accompanying images within the manuscript.

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