Реферати

ВЗАЄМОЗВ'ЯЗОК НАПРУЖЕНО-ДЕФОРМОВАНОГО СТАНУ В КІНЕМАТИЧНОМУ ЛАНЦЮЗІ «КУЛЬШОВО-КОЛІННОГО СУГЛОБУ» ПРИ ЗМІНІ ШИЙКОВО-ДІАФІЗАРНОГО КУТА В УМОВАХ ДИСПЛАЗІЇ

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Статтю присвячено дослідженню біомеханічних порушень при диспластичному процесі у кульшовому та колінному суглобах з використанням моделі кінцевих елементів при різних шийково-діафізарних кутах (ШДК) проксимального відділу стегнової кістки. При ШДК рівним 90°, напруження шийки стегнової кістки склала - 42,4 МПа (27,6 в нормі). У проксимальному відділі великогомілкової кістки рівень напруженого стану зріс на медіальній стороні до 17,9 МПа (11,1 в нормі), а на латеральній стороні 9,1 МПа (3,5 в нормі). Так на медіальній стороні величина напружень дорівнює 21,6 МПа (11,2 в нормі), на латеральній стороні - 1,7 МПа (2 в нормі). Для ШДК рівного 160° напруження в області кульшового суглоба досягає 26,5 МПа (27,6 в нормі). У проксимальному відділі великогомілкової кістки на медіальній стороні напруження становить 9 МПа (11,1 в нормі), а на латеральній стороні 3,5 МПа (3,5 в нормі). Розподіл напруженого стану в колінному суглобі показав, що на медіальній стороні величина напружень дорівнює 13,1 МПа (11,2 в нормі), а на латеральній стороні - 3,8 МПа (2 в нормі). Порівняльний аналіз проведених розрахунків для моделей з різним ШДК показав, що зменшення ШДК призводить до значного збільшення напруженого стану не тільки в шийці стегнової кістки, але і в колінному суглобі. При збільшенні ШДК зростання напружено-деформованого стану відбувається незначно, в основному, в латеральній частині колінного суглобу.

Ключові слова: зміна ШДК, напружено-деформований стан стегнової кістки, проксимального відділу великогомілкової кістки.

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ВЗАИМОСВЯЗЬ НАПРЯЖЕННО-ДЕФОРМИРОВАННОГО СОСТОЯНИЯ В КИНЕМАТИЧЕСКОЙ ЦЕПИ «ТАЗОБЕДРЕННЫЙ-КОЛЕННЫЙ СУСТАВ» ПРИ ИЗМЕНЕНИИ ШЕЕЧНО-ДИАФИЗАРНОГО УГЛА В УСЛОВИЯХ ДИСПЛАЗИИ

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Статья посвящена исследованию биомеханических нарушений при диспластическом процессе в тазобедренном и коленном суставах с использованием модели конечных элементов при различных шеечно – диафизарных углах (ШДУ) проксимального отдела бедренной кости. При ШДУ равным 90°, напряжение шейки бедренной кости составила - 42,4 МПа (27,6 в норме). В проксимальном отделе большеберцовой кости уровень напряженного состояния вырос на медиальной стороне до 17,9 МПа (11,1 в норме), а на латеральной стороне 9,1 МПа (3,5 в норме). Так на медиальной стороне величина напряжений равна 21,6 МПа (11,2 в норме), на латеральной стороне - 1,7 МПа (2 в норме). Для ШДУ равного 160° напряжение в области тазобедренного сустава достигает 26,5 МПа (27,6 в норме). В проксимальном отделе большеберцовой кости на медиальной стороне напряжение составляет 9 МПа (11,1 в норме), а на латеральной стороне 3,5 МПа (3,5 в норме). Распределение напряженного состояния в коленном суставе показало, что на медиальной стороне величина напряжений равна 13,1 МПа (11,2 в норме), а на латеральной стороне - 3,8 МПа (2 в норме). Сравнительный анализ проведенных расчетов для моделей с различным ШДУ показал, что уменьшение ШДУ приводит к значительному увеличению напряженного состояния не только в шейке бедренной кости, но и в коленном суставе. При увеличении ШДУ рост напряженно-деформированного состояния происходит незначительно, в основном, в латеральной части коленного сустава.

Ключевые слова: изменение ШДУ, напряженно-деформированное состояние бедренной кости, проксимального отдела большеберцовой кости.

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ANALYSIS OF DENTURE BASE IMPACT ON THE DENTURE FOUNDATION AREA TISSUES

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The article presents the results of the study of the dental base impact on the denture foundation area tissues. The study was conducted in 149 patients aged 41 to 74 years. Removable partial laminar dentures for the upper and lower jaws were made of plastics "Ftorax" and "Etacryl-02" by three technologies: in a "water bath", in a dry polymerizer under the pressure and in an advanced injection molding machine. The results obtained allow us to recommend the technology of manufacturing removable partial laminar dentures in the advanced injection molding machine for using in dental orthopedics clinic.

Key words: removable partial laminar dentures, polymerization technologies, base plastics, denture foundation area.

The study is a fragment of the research project "New approaches to the diagnosis and treatment of secondary adentia, periodontal and TMJ tissue lesions in adults", state registration No. 0117U000302.

Modern orthopedic dentistry offers a large number of structures that are used in the restoration of partial defects of the dental arches [6].

Rehabilitation of patients with partial teeth loss is a difficult problem in the manufacturing dentures, which must be high-grade as to functional, aesthetic and psycho-emotional. Despite the emergence of new base materials, acrylic plastics are usually essential for the manufacturing removable partial laminar dentures [2].

The experience of using acrylic plastics for the manufacturing removable partial laminar dentures testifies to their relative chemical resistance, satisfactory strength, good aesthetic properties and functionality. At the same time, long-term clinical observations point to some of their disadvantages [4].

One of the ways to eliminate the disadvantages of base acrylic plastics is to improve their physical, mechanical and chemical characteristics. It is possible to increase various physical, mechanical and chemical properties of these plastics by using different technologies of manufacturing bases of removable partial laminar dentures [1, 3].

Manufacturing of removable partial laminar dentures using different technologies of acrylic plastics polymerization will solve the problem of the negative impact of bases of removable partial laminar dentures on the denture foundation area tissues [5].

Thus, the problem of the direct impact of materials used for the manufacturing removable partial laminar dentures is one of the main and relevant in the dental orthopedics clinic.

The purpose of the work was to analyze the dental base impact, made by various technologies, on the denture foundation area tissues.

Materials and methods. The study of the dental base impact on the denture foundation area tissues was performed by observation of 149 patients aged 41 to 74 years, for which were made of plastics "Ftorax" and "Etacryl-02" 188 removable partial laminar dentures on the upper and lower jaws. The base plastics polymerization was carried out in a "water bath", in a dry polymerizer under the pressure and in an advanced injection molding machine.

Group I (control group) included patients who had removable partial laminar dentures made of base acrylic plastic "Ftorax". Polymerization of base acrylic plastic "Ftorax" was carried out in a "water bath".

Patients of Group II were made removable partial laminar dentures of base acrylic plastic "Ftorax". Polymerization of base acrylic plastic "Ftorax" was carried out in a dry polymerizer under the pressure.

Patients of Group III were made removable partial laminar dentures of base acrylic plastic "Ftorax", the polymerization of which was carried out in an advanced injection molding machine.

Group IV (control group) included patients for whom were made removable partial laminar dentures of base acrylic plastic "Etacryl-02" in a "water bath".

Group V included patients with removable partial laminar dentures of base acrylic plastic "Etacryl-02" in a dry polymerizer under the pressure.

Patients of Group VI were made removable partial laminar dentures of base acrylic plastic "Etacryl-02" by injection molding technique.

The patients have been under our observation for three years.

The dental prosthetic rehabilitation effectiveness and the use period of removable partial laminar dentures depends on the completeness of clinical examinations, the denture foundation area state, and the dentures manufacturing technology. In order to establish the validity of this conclusion, we performed comparative clinical and laboratory studies of the extent of the dental base impact on the denture foundation area tissues, as well as the study of the chewing effectiveness with removable laminar dentures, which were made in various polymerization methods.

Results of the study and their discussion. Clinical assessment of removable partial laminar dentures quality, which bases were made by various methods, was carried out using subjective data (complaints, disease and life history) and basic objective data (examination, palpation).

When using partial removable partial laminar dentures, some patients complained of pain under the denture base, the impossibility of prolonged use of the denture. Physical examination revealed limited inflammation sites in certain denture foundation areas: hyperemia, edema, abrasion, erosion up to 1 cm^2, which is due to the mechanical pressure of individual sections of the denture bases.

Other patients complained of mucous membrane burning under the denture base, its dryness. The mucous membrane of the denture foundation area, especially on the upper jaw, is diffusely hyperemic, swollen, painful on palpation, which depends rather on the toxic effect of the denture bases residual monomer. This significantly leads to an increase in the adaptation time to removable laminar dentures, unnecessarily more relines, accelerated development of atrophic changes of the mucous membrane and bone tissue of the denture foundation area.

Schiller-Pisarev solution was used for objective comparative evaluation of removable partial laminar dentures, determination of inflammation of the denture foundation area mucosa as a result of mechanical over stressing and the base plastics toxicity. Mucous staining was performed not only to asset the damage area in the toxic effect and over stressing, but also to improve the accuracy of the denture bases areas reline during mechanical action.

Clinical assessment of the state of the denture bases areas tissues and the quality of dentures was performed at different times of using removable partial laminar dentures (24 hours, 7 days, 1 month).

One of the quality indicators of manufacturing removable partial laminar dentures is the need for their reline at various stages of their use.

Table 1 shows data on the frequency and number of relines of removable partial laminar dentures made using different polymerization methods for base plastics.

Table 1

Number of removable partial laminar dentures relines in experimental groups of patients

Number of relines	Group I		Group II		Group III		Group IV		Group V		Group VI	
	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
	33	100	32	100	33	100	28	100	35	100	27	100
1 reline	27	81.8	25	78.1	24	72.7	24	85.7	24	68.5	16	59.3
2 relines	20	60.6	12	37.5	10	30.3	14	50.0	10	28.6	8	29.6
3 relines	8	24.2	2	6.3	2	6.1	5	17.9	2	5.7	2	7.4

In Groups I and IV (control groups), 27 and 24 relines were performed 24 hours after the removable partial laminar denture delivery, which is 81.8±0.012% and 85.7±0.019%, respectively, according to the manufactured dentures. The repeated denture relines of patients in these groups were respectively 60.6±0.015% and 50.0±0.26%. The third reline of dentures made by the conventional polymerization technology ("water bath") were, respectively, 24.2±0.029% and 17.9±0.032%.

In the patients of Groups II and V, studies have shown that 25 and 24 removable partial laminar dentures needed reline in 24 hours after the delivery to the oral cavity, which is 78.1±0.015% and 68.5±0.017%, respectively. 12 and 10 dentures of these groups were subject to repeated reline, which was respectively 37.5±0.019% and 28.6±0.026%. Two dentures were subject to reline for the third time and this was 6.3±0.1% and 5.7±0.1%, respectively.

Dentures of patients of Groups III and VI were also subject to reline, but their number was much fewer in comparison with the Groups I and IV. Thus, 24 dentures of the Group III and 16 prostheses of the Group VI were subject to the first reline, which was 72.7±0.018% and 59.3±0.018% respectively. But only 30.3±0.023% and 29.6±0.029% of dentures in these groups needed a second reline. The third reline was subject to 6.1±0.1% and 7.4±0.1% dentures of patients of Groups III and VI.

Table 2 shows the data of Schiller-Pisarev test in the examined patients, which revealed limited inflammation sites (the result of traumatic action) and diffuse inflammatory processes of the denture foundation area (toxic effect).

Table 2

Indicators of the Schiller-Pisarev test in the experimental groups of patients

Group of patients	Number of patients	Indices of Schiller-Pisarev test								
		after 24 hours			after 7 days			after 1 month		
		+	++	+++	+	++	+++	+	++	+++
I	абс.	3	2	1	6	3	1	9	3	1
	%	11.1	7.4	3.7	22.2	11.1	3.7	33.3	11.1	3.7
II	абс.	1	1	-	2	2	-	5	1	-
	%	4.2	4.2	-	8.4	8.4	-	20.8	4.2	-
III	абс.	2	1	-	3	-	-	-	-	-
	%	8.0	4.0	-	12.0	-	-	-	-	-
IV	абс.	3	2	-	5	3	-	10	4	1
	%	11.5	7.7	-	19.2	11.5	-	38.5	15.4	3.8
V	абс.	4	3	1	3	1	-	2	-	-
	%	17.4	13.1	4.3	13.1	4.3	-	8.7	-	-
VI	абс.	3	2	-	3	-	-	1	-	-
	%	12.5	8.4	-	12.5	-	-	4.2	-	-

As it is shown in table 2, after 24 hours traumatic lesions in patients of Groups I and IV were 18.5±0.037% and 20.0±0.32%, respectively.

After 7 days, local inflammation associated with the traumatic effect of removable laminar dentures in Groups I and IV was noted in 33.3±0.05% and 32.0±0.33%, respectively.

After 1 month of observation, traumatic injuries in these groups were within 44.4±0.023% (Group I) and 56.0±0.021% (Group IV).

In 24 hours after the denture delivery local inflammation in Groups II and V was 8.3±0.1% and 30.4±0.02%, respectively. After 7 days, local lesions in Group II were diagnosed in 16.7±0.082%, and in

Group V in 17.4±0.04%. After 1 month of observation, they were detected in 25.0±0.037% of patients of Group II and in 8.7±0.1% of patients of Group V.

In 24 hours after using dentures, local inflammation In patients of Groups III and VI was 12.5±0.033% and 20.8±0.037%, respectively. After 7 days, these indicators in both Groups III and VI were equal to 12.5±0.06%. After 1 month of observation, local inflammation of the mucous membrane was detected in 1 patient of Group VI, which is 4.2%.

From the data in Table 2, it is seen that the toxic lesions frequency of mucous membrane of the denture foundation area at all observation periods in patients of Group I is 3.7%, in Group IV toxic lesion of the mucous membrane was detected in 1 patient, which is 4.0%.

After 24 hours of denture use, there was also a toxic lesion in 1 patient (4.3%) in Group V.

However, in Groups III and VI, a toxic lesion of mucous membrane of the denture foundation area was not visible.

One of the quality criteria for the manufacturing removable partial laminar dentures is the frequency of repairs.

Table 3 shows the frequency of removable laminar dentures breakdowns manufactured by various polymerization technologies. The observation period was 3 years.

Table 3

The frequency of removable partial laminar dentures repairs

Patient groups and number of manufactured dentures	Number of removable partial laminar dentures, which were subject to repair		
	n	M±m (%)	Significance test
Group I (33)	9	27.3±0.03	$p < 0.05$
Group II (32)	2	6.25±0.05	$p < 0.001$
Group III (33)	1	3.0	$p < 0.05$
Group IV (28)	7	25.0±0.03	$p < 0.05$
Group V (35)	3	8.6±0.03	$p < 0.05$
Group VI (27)	-	-	$p > 0.05$

Data in table 3 indicate that removable partial laminar dentures manufactured in a "water bath" were more often subject to repair than removable partial laminar dentures made in an advanced injection molding machine ($p < 0.05$).

With regard to this indicator in the Groups II and III, V and VI, we can only say that there is a tendency to improve the removable partial laminar dentures quality manufactured in an advanced injection molding machine compared to removable partial laminar dentures manufactured in the dry polymerizer under the pressure.

The analysis of the literature data confirmed the relevance of further study of the polymerization efficiency of acrylic plastics by "water bath" polymerization and dry polymerizer under the pressure in a comparative aspect.

Differences in the obtained results, in our opinion, is explained not only by the manufacturability of the polymerization technologies, but also by the differences in the ratio of the acrylic plastics components (monomer-polymer), which, in turn, affects the quality of the manufactured structure [1].

Thus, the obtained data analysis with respect to the reline's number made it possible to obtain a statistically significant reliability of differences ($p > 0.05$), which testifies to the influence of polymerization technologies on the frequency and the number of removable partial laminar dentures relines.

The data obtained regarding the frequency of traumatic mucosal lesions that cause removable partial laminar dentures manufactured by various polymerization technologies is statistically significantly different ($p < 0.05$). The toxic effect of removable partial laminar dentures from base acrylic plastics "Ftorax" and "Etacryl-02" made by the polymerization technology in a "water bath" is significantly different from the action of removable partial laminar dentures from the same base plastics made in a dry polymerizer under the pressure and in an advanced injection molding machine ($p < 0.05$).

The data obtained coincide with the results of other authors [6], which indicate the potential risk of injury to the denture foundation area mucosa and the toxic effect of residual monomer as the most common complications when using acrylic base plastics.

Due to the fact that all dentures were made by the same Dental Technician in accordance with technological methods, we can express an opinion on the polymerization technologies influence on the quality of manufactured removable partial laminar dentures. This opinion is validly confirmed by the frequency of repair of the dentures bases manufactured using various technologies.

Conclusions

1. The development and duration of inflammatory processes in the mucous membrane of denture foundation area depend on the action of removable partial laminar dentures manufactured by various polymerization technologies.

2. The duration of the inflammatory processes of the mucous membrane under dentures, polymerized under pressure in a dry environment and in an advanced injection molding machine of base plastics, is much shorter.

3. Removable partial laminar dentures manufactured in an advanced injection molding machine have no toxic effect on the mucous membrane of the denture foundation area.

Prospects for further research *will concern a detailed study in the comparative aspect of restoring chewing efficiency using partial removable plate prostheses manufactured by the above technologies.*

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Реферати

АНАЛІЗ ВПЛИВУ ПРОТЕЗНОГО БАЗИСА НА ТКАНИНИ ПРОТЕЗНОГО ЛОЖА

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У статті наведено результати дослідження впливу протезного базису на тканини протезного ложа. Дослідження проведено на 149 хворих віком від 41 до 74 років. Часткові знімні пластинкові протези на верхню та нижню щелепи з пластмас «Фторакс» і «Етакрил-02» виготовлялися трьома методами: на «водяній бані», в апараті для сухої полімеризації під тиском та в удосконаленому апараті для литтьового пресування. Отримані результати дозволяють рекомендувати до використання в клініці ортопедичної стоматології методику виготовлення часткових знімних пластинкових протезів в удосконаленому апараті для литтьового пресування.

Ключові слова: частковий знімний пластинковий протез, методи полімеризації, базисні пластмаси, протезне ложе.

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АНАЛИЗ ВЛИЯНИЯ ПРОТЕЗНОГО БАЗИСА НА ТКАНИ ПРОТЕЗНОГО ЛОЖА

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В статье приведены результаты исследования влияния протезного базиса на ткани протезного ложа. Исследование проведено на 149 больных в возрасте от 41 до 74 лет. Частичные съёмные пластиночные протезы на верхнюю и нижнюю челюсти из пластмасс «Фторакс» и «Этакрил-02» изготавливались тремя методами: на «водяной бане», в аппарате для сухой полимеризации под давлением и в усовершенствованном аппарате для литьевого прессования. Полученные результаты позволяют рекомендовать к использованию в клинике ортопедической стоматологии методику изготовления частичных съёмных пластиночных протезов в усовершенствованном аппарате для литьевого прессования.

Ключевые слова: частичный съёмный пластиночный протез, методы полимеризации, базисные пластмассы, протезное ложе.

Рецензент Аветіков Д.С.