



ORTHOPEDIC TREATMENT OF A PATIENT WITH DENTITION DEFECT IN FRONTAL DIVISION WITH COMPENSATED FORM OF EXCESSIVE ATTRITION BY ADHESIVE DENTAL BRIDGE

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Relevance

- ▶ **In excessive attrition, teeth change the anatomical shape of the crown part of the teeth and the character of the distribution of the mastication pressure on the cutting and chewing surfaces. Dentition defects accompany this process and need the use of adhesive dental bridge (ADB), which is more suited to modern biotechnological requirements.**

Purpose of the Study

- ▶ **Statistical study of the sizes of the oral surfaces of teeth in the frontal group in patients with a compensated form of excessive attrition, with analysis of the principle possibility of using these teeth as supporting elements of ADB.**

Materials & Methods

- ▶ Based on the preliminary examination 30 patients had been selected (18 men and 12 women) with the 1st (attrition up to $\frac{1}{3}$ of the height of the tooth crown) and the 2nd (attrition of teeth up to $\frac{2}{3}$ of the height of the tooth crown) by the degree of compensated excessive attrition of the teeth at the age of 35 to 55 years. Of these, two groups of 15 patients had been formed. The third control group, which examined intact dentition and physiological bite forms, comprised 15 patients.
- ▶ Complete anatomical impressions with silicone impression materials had been received for all patients. Cast combined models were used in the investigations. The oral surfaces of the abutment upper and lower teeth were coated with a thin layer of petroleum jelly. The steel balls with a diameter of 1 mm that fit snugly against each other and lie with one layer on the model. The area of the oral surfaces of the frontal teeth was measured.

Materials & Methods

- ▶ A mathematical model of work had been used for rational planning of ADB support elements. A maximum load on the tooth connects the maximum stress on the adhesion surface to the adhesion area.
- ▶ The magnitude of the maximum load force per one supporting tooth and the maximum available tooth area for fixing the ADB had been set. The necessary range of adhesion areas to calculate the maximum stresses based on a mathematical model is calculated.

$$\tau_{max} = \tau(S) = \frac{F}{2S} + 2\sqrt{\pi} \frac{mFL}{S^{3/2}}$$

Results & Discussion

- The results of studies of 45 patients (270 teeth) conducted on models allowed us to determine the area of the oral surfaces of the frontal teeth, depending on the degree of pathological attrition.

Groups of the tooth	Morphological changes	The area of oral surfaces		
		I	II	III
Central incisor of the upper jaw	M ± m p*	38.44 ± 3.97 p<0.01	29.80 ± 3.51 p<0.001	52.15 ± 4.93 p<0.01
Lateral incisor of the upper jaw	M ± m p*	30.48 ± 2.98 p<0.01	22.00 ± 2.4 p<0.001	44.25 ± 4.66 p<0.01
Canine of the upper jaw	M ± m p*	45.325 ± 5.89 p<0.01	31.690 ± 4.82 p<0.001	70.60 ± 7.9 p<0.01
Central incisor of the lower jaw	M ± m p*	25.72 ± 3.01 p<0.01	16.58 ± 2.45 p<0.001	40,09 ± 3,89 p<0.01
Lateral incisor of the lower jaw	M ± m p*	30.08 ± 3.24 p<0.01	20.86 ± 2.52 p<0.001	43.56 ± 4.12 p<0.01
Canine of the lower jaw	M ± m p*	36.55 ± 4.21 p<0.001	22.88 ± 3.65 p<0.001	58.74 ± 6.17 p<0.01

*: the difference is distinct from the corresponding parameters of the control group.

Results & Discussion

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- The results of calculations of the maximum tension for the required range of adhesion areas, performed using the Mises-Hencky Maximum Stress Criterion for a diapason of areas covering all practically possible values of the surfaces of first teeth on the frontal division when the area changed in steps of 5 mm².

Adhesion area, m ²	Tension with the weight of 90 H, MPa	Tension with the weight of 75 H, MPa	Adhesion area, m ²	Tension with the weight of 90H, MPa	Tension with the weight of 75 H, MPa
9.500E-6	9.731	8.152	1.650E-5	5.567	4.658
1.000E-5	9.238	7.738	1.700E-5	5.402	4.519
1.050E-5	8.793	7.364	1.750E-5	5.246	4.389
1.100E-5	8.388	7.025	1.800E-5	5.099	4.265
1.150E-5	8.019	6.715	1.850E-5	4.960	4.149
1.200E-5	7.681	6.431	1.900E-5	4.828	4.038
1.250E-5	7.370	6.170	1.950E-5	4.703	3.934
1.300E-5	7.084	5.930	2.000E-5	4.584	3.834
1.350E-5	6.819	5.707	2.050E-5	4.471	3.740
1.400E-5	6.572	5.501	2.100E-5	4.364	3.650
1.450E-5	6.343	5.309	2.150E-5	4.262	3.564
1.500E-5	6.130	5.130	2.200E-5	4.164	3.482
1.550E-5	5.930	4.962	2.250E-5	4.071	3.404
1.600E-5	5.743	4.805	2.300E-5	3.981	3.329

Results & Discussion

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- Calculations and clinical investigations show the current results of using adhesive materials for ADB of patients with a compensated form of excessive attrition.

Acceptable materials for ADB used in the first degree of excessive attrition

Groups of the tooth	Acceptable materials			
	Often	In 84 % of cases	In 50 % of cases	Reserve with 1.25
Central incisor of the upper jaw	All	All	All	All
Lateral incisor of the upper jaw	"Bifix", "Stomazit-LC"	All	All	All
Canine of the upper jaw	All	All	All	All
Central incisor of the lower jaw	Not mentioned	All	All	All
Lateral incisor of the lower jaw	"Stomazit-LC"	All	All	All
Canine of the lower jaw	All	All	All	All

Results & Discussion

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- Calculations and clinical investigations show the current results of using adhesive materials for ADB of patients with a compensated form of excessive attrition.

Acceptable materials for ADB used in the second degree of excessive attrition

Groups of the tooth	Acceptable materials			
	Often	In 84 % of cases	In 50 % of cases	Reserve with 1.25
Central incisor of the upper jaw	"Stomazit-LC"	All	All	All
Lateral incisor of the upper jaw	Not mentioned	"Stomazit-LC"	"Bifix"	All
Canine of the upper jaw	Not mentioned	All	All	"Bifix", "Stomazit-LC"
Central incisor of the lower jaw	Not mentioned	Not mentioned	Not mentioned	"Stomazit-LC" in 50 % of cases
Lateral incisor of the lower jaw	Not mentioned	"Stomazit-LC"	"Bifix", "Stomazit-LC"	"Bifix", "Stomazit-LC" in 84 % of cases
Canine of the lower jaw	Not mentioned	"Stomazit-LC"	All	All

Conclusions

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- ▶ **Medium-sized areas of the oral surfaces of the upper and lower teeth, based on clinical and laboratory experiments, have been identified.**
- ▶ **The size of the oral surface area serves as a criterion for the location, shape, and number of ADB abutments.**
- ▶ **Smaller areas require increased preparation or construction measures (more support abutments, use of stronger adhesives, careful surface preparation).**
- ▶ **Modern adhesive materials are helpful for patients with first-degree excessive attrition in orthopedic treatment of minor dentition defects in the frontal division for patients with second-degree excessive attrition. The material “Stomazit-LC” has specific physical, mechanical, and biological properties, such as adhesiveness, strength, and biocompatibility, and should be a priority choice in relevant protocols for the orthopedic management of patients with horizontal excessive tooth attrition.**