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For students, research workers.
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APPLICATION OF RHEOVASOGRAPHY TO EVALUATE THE EFFECTIVENESS OF USING FULL REMOVABLE DENTURES MADE BY VARIOUS METHODS

Abstract: Using a device of our own design, the blood flow in the tissues of the palate was examined in 46 patients with full removable dentures in which the occlusal surface of the dentition, as well as their shape, were designed, respectively, according to the numerical values of A.N. Hubska, V.S. Babych and with the help of bracket device by V.I. Novikova (group I – 16 people); according to M.Ye. Vasyliev (group II – 16 people); according to the occlusal matrices of A.N. Hubska and using a special device designed by M.I. Rabovil (group III – 14 people). 276 rheovasograms of the palatal tissues were studied. It was found that in all patients prior to prosthetics, the initial state of blood circulation did not differ from one another. After 3 months of using prostheses in all groups, the blood supply to the tissues of the palate worsened, however, these changes were more pronounced in patients of group II. After 6 months, a slight decrease in the vascular tone index (VTI) within the tissues of the palate was noted in patients of groups I and II, which is explained by a tendency towards normalization of blood flow. In patients of group III, the VTI remained at the same level. The results of the study showed that, in patients of group III, the adaptation of blood circulation to the mechanical effect of the prosthesis took place 3 months earlier.

Key words: rheovasographic device; full removable dentures and methods of their manufacturing; rheographic study of the effectiveness of various methods of designing full removable dentures.

Rheography, according to A.I. Rybakov, is one of the main methods of objective assessment of the effectiveness of therapeutic and preventive measures in dentistry. To study the functional state of peripheral hemodynamics, V.A. Karelin (1957) proposed the term "rheovasography" (RVG) (according to H.P. Matveikov and S.S. Pshonin [6]). Various techniques for conducting RVG have been developed and improved, the essence of which is that the electrodes used for these purposes are fixed on the mucous membrane with medical glue or adhesive tape, or they are spring loaded [8], which ultimately affects the quality of rheographic studies. For the RVG of the palatal tissues, we have previously developed a special device [2], which ensures high reliability of research results by monitoring the contact of the electrodes at their minimum pressure on the investigated surface of the prosthetic bed. There are known methods for the construction of artificial dentitions, in which their occlusal surface is formed using, for example, the numerical values of M.Ye. Vasyliev [3], A.N. Hubska, V.S. Babych [4], as well as the occlusal matrices of A.N. Hubska [5]. At the same time, the determination of landmarks for creating the shape of the dentures is also carried out by different methods: 1) along the oval of the upper bite rim [3]; 2) using a bracket device by V.I. Novikova [7]; and 3) using a special device designed by M.I. Rabovil [10]; the disadvantages of the first two were indicated earlier [10, 11].

The effectiveness of prosthetics of patients with full removable dentures, in which the dentition is constructed by the above-mentioned methods, has been demonstrated by us in earlier publications and is based on the study of chewing samples, visual evaluation of the prosthetic bed [9, 11], as well as on a cytological study of the state of the mucous membrane under the bases of the dentures [12-13].

In the literature available to us, we did not find any works dedicated to the study of the hemodynamics of the palatal tissues under the bases of dentures in patients with complete absence of teeth.

The objective of this study was to explore the circulation of blood in the tissues of the palate using an electrode device of our design in patients who used full removable dentures, in which the occlusal surface of the dentition, as well as their shape, were designed by various methods mentioned above.

Research methods and materials.

The study of regional hemodynamics of the palate was carried out on 46 patients in the age of 61-70 years. During the selection, special attention was paid to the absence of severe traumatic brain injuries, previous diseases of the brain and the heart, hypertension in the medical history of these patients, as well as the absence of acute infectious diseases in them over the past three months. The patients were divided into 3 groups: group I (16 patients) – the occlusal surface of the artificial dentitions and their shapes were designed accordingly by the numerical values of A.N. Hubska – V.S. Babych [4] and with the use of a bracket device by V. I. Novikova [7]; group II (16 patients) – according to M.Ye. Vasyliev [3]; and group III (14 patients) – according to occlusal matrices [5], made by our proposed method [1] and using a device for accurate determination of landmarks in the design of dental rows [10], that is, according to the technology we have improved. The examined patients were divided as follows: women in group I – 10, in group II – 12, and in group III – 8; the numbers of men were – 6, 4, and 6, respectively. The condition of the alveolar processes of the edentulous jaws was the same in all groups (Schroeder/Keller) I-II / III-IV). It should be noted that the second group of patients was the control compared to the first one, whilst the latter one was the control one in relation to the third group under the study. The state of the regional hemodynamics of the tissues of the palate was investigated with a rheographic extension RG-4-0I, connected to a four-channel electrocardiograph "ELKAR-4". For rheovasography of palate tissues, a device of our own design was used [2]. The device (Fig. 1) contains a plastic basis spoon with a T-shaped protrusion, a removable block with electrodes for connecting to the basis spoon via groove. In the detachable unit, threaded bushings with connectors are mounted at the same distance from each other. The electrodes are inserted into the connectors through the holes on the palatal side of the basis spoon. Each individual basis spoon is placed on the patient's upper jaw; the passive electrode is fixed on the patient's hand; and then the electrodes are connected to the indicator. Rotating the bushings alternately until the indicator light comes on, the electrodes are brought into contact with the palatal surface of the jaw at minimum

pressure; after that their position gets fixed. Then the electrodes get disconnected from the indicator and connected to the inputs of the rheometer. The RVG was recorded in patients before prosthetics, as well as after 3 and 6 months of wearing full removable dentures.

The RVGs obtained in the study were subjected to visual evaluation and clinical analysis according to the method described by A.A. Prokhonchukov, N.K. Lohinova, and R.I. Mykhailova [8]. The interpretation of digital quantitative parameters was carried out according to the five main indicators: duration of anacrota (α) and catacrota (β) in seconds, duration of the entire cycle (T) in seconds, the rheographic index (RI) in Ohms, and vascular tone index (VTI) in percents. We studied 276 rheovasograms of the palatal tissues, on which 1104 measurements were carried out.

All obtained digital indicators were processed by the method of variation statistics, and the results are summarized in Table 1.

Research results and their discussion.

Visually, the RVGs of the patients before prosthetics were of the same type in all groups. After 3 months of using dentures, the curvature of the inclination of the rheographic curve increased, its top smoothed, and the RVG amplitude decreased. The above mentioned changes in the architectonics of the rheographic curve were more pronounced in patients of the second group.

After 6 months of using dentures, a slight increase in the RVG amplitude was observed, the steepness of the slope of the curve decreased: these changes were more pronounced in the third group of patients.
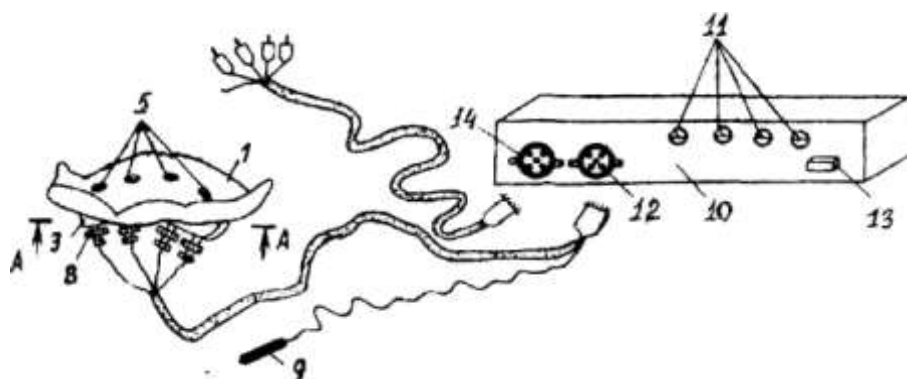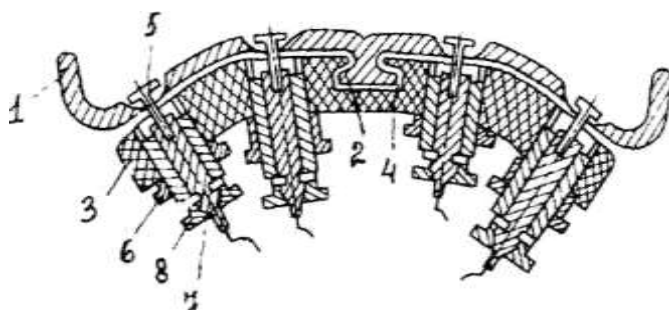
Fig. 1 Electrode device for rheovasography of palatal tissues: a – general view; b – section along A-A

A-A

1 – basis spoon; 2 – T-shaped protrusion; 3 – detachable unit; 4 – groove; 5 – electrodes; 6 – threaded bushings; 7 – connectors; 8 – retainer nut; 9 – passive electrode; 10 indicator; 11 – signal lights; 12 – socket indicator; 13 – switch; 14 – socket for connection to a rheometer.

Table 1

The average indicators of blood circulation in the tissues of the palate of patients using full removable dentures, in which the occlusal surface of the dentition and their shapes were designed, respectively, according to A.N. Hubska, V.S.Babych – V.I.Novikova (group I); according to M.Ye. Vasyliev (Group II) and according to our improved technology (Group III)

No.	RVG indicators	Group	Statistical indicators	Before prosthetics		3 months after prosthetics		6 months after prosthetics	
				right side	left side	right side	left side	right side	left side
1	2	3	4	5	6	7	8	9	10
1	RI (in Ohms)	I	M±m	0,11± 0,008	0,10± 0,005	0,08± 0,003	0,07± 0,004	0,09± 0,005	0,08± 0,003
		II	M±m	0,12± 0,007	0,11± 0,006	0,06± 0,002	0,06± 0,003	0,08± 0,005	0,08± 0,004
		III	M±m	0,10± 0,006	0,10± 0,006	0,09± 0,003	0,08± 0,002	0,010± 0,005	0,09± 0,007
			t I-II (P)	0,98 (<0,3)	1,28 (<0,2)	5,55 (<0,001)	2,0 (=0,05)	1,43 (<0,2)	
			t I-III (P)	1,0		2,38 (<0,02)	2,27 (<0,02)	1,43 (<0,2)	1,31 (=0,2)
2	α (in sec.)	I	M±m	0,17± 0,008	0,18± 0,005	0,20± 0,004	0,21± 0,004	0,19± 0,008	0,20± 0,008
		II	M±m	0,17± 0,011	0,18± 0,008	0,23± 0,008	0,23± 0,009	0,21± 0,011	0,21± 0,007
		III	M±m	0,17± 0,009	0,18± 0,011	0,19± 0,004	0,20± 0,004	0,19± 0,007	0,20± 0,010
			t I-II (P)			3,37 (>0,001)	2,04	1,53 (<0,1)	1,0 (<0,3)
			t I-III (P)	1,0		2,0 (=0,05)	2,0 (=0,05)		
3	β (in	I	M±m	0,62± 0,017	0,62± 0,018	0,65± 0,004	0,65± 0,003	0,64± 0,004	0,63± 0,008
		II	M± m	0,61± 0,27	0,63± 0,026	0,66± 0,003	0,67± 0,004	0,64± 0,009	0,65± 0,011
		III	M± m	0,62± 0,013	0,62± 0,010	0,64± 0,004	0,64± 0,003	0,63± 0,005	0,63± 0,006
			t I-II (P)	0,31 (<0,7)	0,32 (<0,7)	2,0 (=0,05)	4,0 (<0,001)		1,54 (<0,2)

			t I-III (P)				2,38 (<0,02)	1,56 (<0,1)	
4	T (in	I	M± m	0,80± 0,019	0,79± 0,021	0,85± 0,007	0,86± 0,006	0,83± 0,009	0,83± 0,012
		II	M± m	0,79± 0,033	0,81± 0,030	0,88± 0,011	0,91± 0,011	0,86± 0,017	0,87± 0,015
		III	M± m	0,79± 0,021	0,81± 0,020	0,83± 0,008	0,84± 0,007	0,83± 0,011	0,84± 0,012
			t I-II (P)	0,26 (<0,7)	0,55 (<0,6)	2,31 (<0,02)	4,16 (<0,001)	1,58 (<0,1)	2,10 (<0,02)
			t I-III (P)	0,35 (<0,7)	0,69 (<0,5)	2,0 (=0,05)	2,17 (<0,02)		0,62 (<0,5)
5	VTI (%)	I	M± m	21,25± 0,49	22,78± 0,03	23,53± 0,27	24,42± 0,29	22,89± 0,72	24,09± 0,61
		II	M± m	21,52± 0,5	22,22± 0,17	26,13± 0,58	25,27± 0,68	24,42± 0,79	24,13± 0,39
		III	M± m	21,52± 0,57	22,22± 0,81	22,89± 0,26	23,81± 0,27	22,89± 0,55	23,81± 0,84
			t I-II (P)	0,38 (<0,7)	3,1 (<0,01)	4,06 (<0,001)	1,15 (<0,2)	1,44 (<0,1)	0,05 (0,9)
			t I-III (P)			1,73 (>0,1)	1,56 (<0,1)		0,27 (<0,8)

Note: the number of patients in group I – 16, group II – 16, and group III – 14.
note

Along with a change in the form of RVGs, deviations from other quantitative indicators were also noted. The analysis of temporal quantitative indicators of longitudinal RVGs of palatal tissues in the examined groups showed a significant difference in the process of adaptation of regional blood flow to the compression effect of full removable dentures made by various methods (Table 1). The studies of blood circulation in the tissues of the palate of patients before prosthetics showed that the initial state of blood circulation did not differ from each other, and after 3 months of using dentures in all groups, there was a decrease in pulse blood filling (RI); however, it was uneven. Thus, the RI value in the second group decreased compared to the initial data on the right side – by 50%, on the left side – by 45.4%; while in the first and third groups, on the right side – by 27.3% and 25%, respectively, and on the left side – by

30% and 20%, respectively. It can be seen from the data presented that RI was less pronounced in the first group compared to the second group, as well as in the third group – compared to the first and second groups; RI during this period was significantly higher in the first and third groups compared to the second one.

After 6 months, there was an increase in RI in all groups. However, this increase was more pronounced in the second group and amounted to 33.3%. In the first group, the RI value increased on the right side by 12.5%, on the left side – by 14.3%, while in the third group – by 11.1% on the right side and 12.5% on the left side. The differences in pulse blood filling in these groups during this period were statistically insignificant. In this period, the RI value compared with the initial data was decreased in patients of the second group by 33.3% on the right side and by 27.3% on the left side; in patients of the first group, respectively – by 18.2% and 20%, and in patients of the third group – by 16.7% and 10%, respectively. The ability of the palate vessels to stretch under the effect of the flowing blood mass (α) after 3 months of using dentures decreased compared to the initial data in patients of the second group on the right side – by 35.3%, and on the left side – by 27.7%; while the corresponding figures in patients of the first and third groups were: on the right side – 17.6% and 11.7% decrease; on the left side – 16.6% and 11.1% decrease respectively.

After 6 months, there was an improvement in the indicator (α) in the second group of patients – 8.7% both on the right and the left sides; and in the first group – 5% on the right side, and 4.8% on the left side; in patients of the third group, this indicator remained unchanged. In this period, compared with the initial data, in patients of the second group the indicator (α) was 23.5% higher on the right side, and 16.6% higher on the left side; in patients of the first and third groups, respectively, the same indicator was 11.7% higher on the right side, and 11,1% higher on the left. As can be seen from the above data, the greatest changes in the indicator (α) were noted in patients of the second group, the smallest – in the third group. The ability of the vascular wall to return to its original state (β) by shrinking after 3 months of using full removable dentures significantly decreased in comparison with the initial data in the first and third

groups, respectively, by 4.8% and 3.2%; in patients of the second group on the right side it decreased by 8.2%, while on the left side – by 6.3%.

After 6 months, there was a decrease in the index (β) in all groups, however, this decrease was most pronounced in the second group and amounted to 3%. In patients of the first group, the indicator (β) had a 1.6% smaller value on the right side, and a 3.1% smaller value on the left side; and in the third group, the decrease in the indicator (β) was the same on both sides and was equal to 1.6%. Compared with the initial data in this period, the value of the indicator (β) was higher in patients of the second group: on the right side – by 4.9%, and on the left – by 3.2%. In the first group, this increase was even smaller: on the right side – by 3.2%; on the left side – by 1.6%, the same value applies to the patients of the third group.

When comparing the average rheographic indices obtained in patients of different groups, a tendency towards a slowdown in the speed of propagation of the rheographic wave was clearly manifested. Thus, the value of the indicator (T) statistically significantly increased after 3 months of using dentures in the first group of patients on the right side – by 6.2%, and on the left side – by 8.9%; in the second and third groups, respectively – by 11.4% and 5.1% on the right side, and by 12.3% and 3.7% – on the left. From the given data it can be seen that the blood flow was most significantly slowed down in patients of the second group; the smallest changes were noted in the third group of patients. After 6 months of using dentures, the speed of propagation of the rheographic wave slightly increased in patients of the first and second groups, but not evenly. Thus, the indicator (T) decreased in patients of the second group by 2.3% on the right side and 4.4% on the left; in the first group, respectively – by 2.4% on the right side and 3.5% on the left. In patients of the third group, the indicator (T) remained at the same level. Compared with the initial data, the time of propagation of the rheographic wave increased in the first group of patients by 3.7% on the right side and 5.1% on the left side; in the second and third groups, respectively, by 8.8% and 5.1% – on the right side, and by 7.4 % and 3.7% – on the left.

The character of changes in all of the above rheographic indicators was predetermined by the value of the vascular tone index (VTI), reflecting such properties of the vascular wall as extensibility and elasticity. In all groups of patients, an increase in VTI was observed, which indicated a lower extensibility of the vessels of the palate during systole. Thus, after 3 months of using full removable dentures, the extensibility of the vessels of the palate during systole decreased in comparison with the initial data in the first group of patients by 10.7% on the right side and by 7.2% – on the left, in the second and third groups, respectively – by 21.4% and 6.3% on the right side, and by 13.7% and 7.1% – on the left. From the presented data, it can be seen that the extensibility of the vessels of the palate during systole is less pronounced in patients of the second group compared with the first group, and in the first group compared with the third group. In the latter group of patients, the vascular tone was slightly increased, but these changes, in contrast to other groups of patients, were evenly presented both on the right and on the left sides.

After 6 months of using dentures, there was a slight decrease in the VTI in the first and second groups. Thus, the value of VTI in the first group decreased by 2.7% on the right side and by 1.4% on the left side, while in the second group, respectively – by 6.6% on the right side, and by 4.5% – on the left. In the third group, the VTI value remained at the same level. In comparison with the initial data, the VTI value in this period was higher in the first group on the right side – by 7.7%, and on the left side – by 5.7%; in the second and third groups, respectively – by 13.5% and 6.4% on the right side, and by 8.6% and 7.1% – on the left side.

The relatively insignificant dynamics of rheographic indicators of the state of blood circulation in the tissues of the palate in patients using various designs of full removable dentures is apparently associated with the primary influence on the shape of the curve of changes in the main properties of the vascular wall, in particular, the vascular tone.

CONCLUSIONS:

Thus, the results of the study of the RVG of the palatal tissues, obtained by us, indicate unfavorable changes in the peripheral hemodynamics in persons using full removable dentures. By the changes in the value of the main rheographic indicators, which took place 3 months after orthopedic treatment, it can be argued that the use of full removable dentures in all groups worsened the blood supply to the tissues of the palate. More pronounced changes were observed in patients of the second group; least pronounced – in the third group. Some decrease in vascular tone explains the tendency towards normalization of blood circulation in the palatal tissues in patients of the first and second groups after 6 months of using the dentures. In patients of the third group, whose dentures were made according to our improved technology, the adaptation of blood flow to the mechanical effect of the dentures occurred 3 months earlier.

List of references

1. A.S. 728856 USSR, M.Cl. A 61C 19/00. Method of manufacturing occlusal matrices and device for its implementation / M.I.Rabovil (USSR). Request No. 2529080/28-13; claimed Oct.03,1977; publ. Apr.25,1980., Bulletin No. 15.

2. A.S. 1387981 USSR, M.Cl. A 61B 5/05. Electrode device for rheography of hard palate. / M.I.Rabovil (USSR). Request No. 4106151 / 28-14; claimed Aug.27,1986; publ. Apr.15,1988, Bulletin No. 14.

3. Vasyliev M.Ye. Dental prosthetics / M.Ye.Vasyliev, A.L.Hrozovskyi, L.V. Iliina-Markosian, M.S.Thyssenbaum.-1946.-Pp.167-189.

4. Hubska A.N. Occlusal curves of full removable dentures/A.N.Hubska, V.S.Babych// Dentistry.-1971, No. 3.-Pp.32-34.

5. Hubska A.N. Occlusal matrices for the anatomical setting of artificial teeth/ A.N.Hubska, M.I. Rabovil// Rationalization proposals and inventions in medicine.-Kyiv: Zdorovia, 1976.-P.108-109.

6. Matveikov H.P., Pshonin S.S. Clinical rheography/H.P.Matveikov, S.S. Pshonin.-Minsk.-Belarus.-1976.-Pp.7-11.

7. Novikova V.I. The shape and size of dentitions in dentures for edentulous jaws: abstract of thesis for the degree of candidate of medical sciences: spec.14.00.21 "Dentistry"/ V.I.Novikova.-Alma-Ata.-1972.-17p.

8. The use of rheography for the study of the functional state of the dentoalveolar system and the diagnosis of dental diseases (method.recommendations)/A.A. Prokhonchukov, N.K.Lohinova, R.I. Mykhailova.-M.: 1977.-P.17.

9. Rabovil M.I. Efficiency of prosthetics in patients with complete absence of teeth by differentiated setting of artificial teeth in the occlusor (wire articulator) / M.I.Rabovil// Healthcare. -Chisinau. -1977.-Pp.46-49.

10. Rabovil M.I. A device for determining the angle of inclination of the interalveolar lines / M.I.Rabovil // Dentistry.-1981, No. 5.-Pp.59-61.

11. Rabovil M.I. Improvement of methods of forming dentures and bases of dentures for patients with complete absence of teeth: abstract of thesis for the degree of candidate of medical sciences: spec.14.00.21 "Dentistry"/ M.I.Rabovil.-K.: - 1984.-24p.

12. Rabovil M.I. Comparative assessment of the state of the mucous membrane under the bases of full removable dentures according to the data of cytological study //Materials of scientific practical conference. "Ecology And Health". Kryvyi Rih, 1994.-P.92.

13. Rabovil M.I. The state of the oral mucosa under the bases of full removable dentures made according to the improved technology //Urgent issues of diagnostics, treatment, sanitary and resort rehabilitation of diseases of internal organs. Materials of scientific practical conference with international participation. – Novomoskovsk, 2010.-Pp.143-144.

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