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Clinical and laboratory justification for the use of dental implantation in patients with hypertension

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Abstract: Dental prosthetics on artificial implant supports most effectively provides the patient with chewing function, anatomical and physiological structure close to the norm, and, consequently, professional and social status necessary for confidence in society. However, the achieved successes in dental implantation do not solve the issues of reducing complications after implant treatment and increasing the terms of use of implants. Great difficulties in the success of the implantation process are associated with background and somatic diseases.

Keywords:

The aim of the study was to improve methods for preventing and predicting complications arising after dental implantation surgery in patients with arterial hypertension..

Materials and research methods. We examined and operated 87 patients with a history of hypertension of varying severity in the polyclinic of Surgical Dentistry and Dental Implantology of the Tashkent State Dental Institute, as well as in the private clinic "Dental Implantation Center" in the period from 2020 to 2023. There were 53 men, which constituted 60.9%, and 34 women, which constituted 39.1% of the total. They were administered 105 CIs from the Osteem system. The characteristics of the patients are presented in Table 1.

Table 1

Patient and patient characteristics and age-related aspects

		Годы			
Gender		**50-55**	**55-60**	**60-65**	**Итого**
Men	n	8	34	11	53
	%	9,2%	39,1%	12,6%	61%
Women	n	4	14	16	34
	%	4,6%	16,1%	18,4%	39%
Total	n	12	48	27	87
	%	13,8%	55,2%	31%	100%

Observation group I (OG) – 31 patients with arterial hypertension of stage I-II (observation group), sedatives (novo-passit), osteogenon, clexane, ethoxib.

Group II - comparison group (CG) - 36 patients with arterial hypertension of I-II degree (comparison group) a) according to the standard treatment protocol.

Group III - control group (CG) - 20 people with GA without arterial hypertension (control group).

Table 2

Setting of DI in jaw sections

	Right-sided distal section	**Front (frontal)**	**Left distal section**	**Total**
upper jaw	18	19	14	51
lower jaw	17	16	21	54
TOTAL	35	35	35	105

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When planning this study, the therapist recommended DI for hypertension of I and II degrees of severity. Patients with a history of severe hypertension were not included in the operation; the refusal of this category of patients was based on the parameters obtained during their examination.

The applied research methods: preoperative preparation of patients consisted of the following activities: collection of information on the anamnesis of life and anamnesis of the disease, local dental status, examination of the implantation site, determination of BP and PS, R-kie: orthopantomography and computed tomography, functional and laboratory examination methods (UDF, hematological blood tests: general and biochemical (total cholesterol, triglycerides, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol). According to the methods of functional diagnostics, hemodynamic parameters were determined, namely BP and HR at the stages: before surgery, after 30 minutes and after premedication, as well as periotestometry [15,16,17,18].

In practical terms, we recommended our patients to take Novopassit orally, 100 ml - dark glass bottles with a measuring cap - at the rate of: 1 measuring cap 3 times a day for 5-7 days before surgery, Ethoxib 30 mg per day for 5-7 days as a pain reliever, to correct blood pressure. Ostegenon for bone mineralization and osseointegration, 2 capsules / 3 times a day for 15-20 days (1 tablet contains 830 mg) before and after the surgical period, and Clexane 4.0 ml subcutaneously for 14 days before surgery.

It was necessary to specify that the patient took the medications of his individual regimen in the morning before the operation, as prescribed by the cardiologist and therapist.

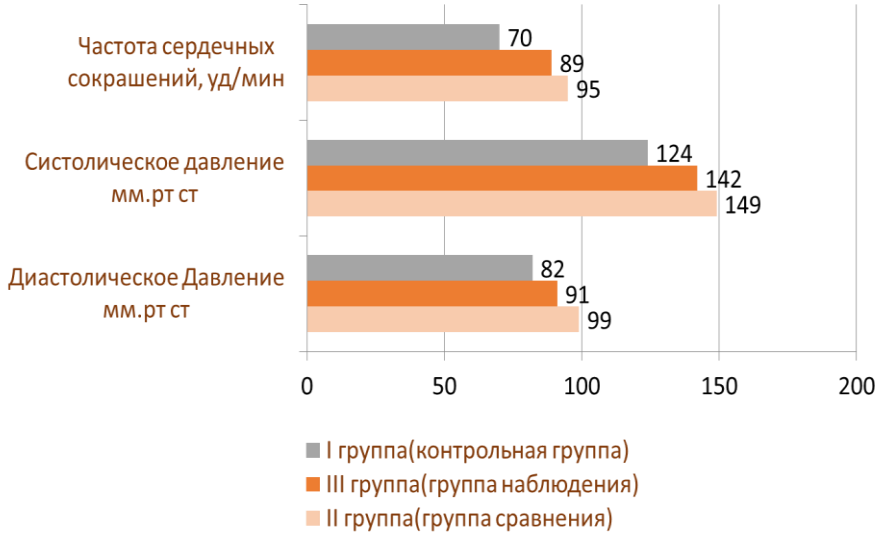
Using ultrasound Doppler flowmetry (UDF), the state of microcirculatory blood flow was determined, both in soft tissues and in hard bones of the implantation bed zone [3,5,7].

Microcirculation of the alveolar processes of the jaws was carried out using the Minimax-Doppler-K device, manufactured by SP Minimax, equipped with 25-5 MHz sensors, the most informative for listening to the depth of the area up to 7-8 mm were 20-25 MHz sensors.

Analysis of the mobility of the installed implant was carried out using the Periotest device (Siemens) [1,2,6,11]. According to our data, only negative PTV values correspond to adequate osseointegration. To process the indicators, variation statistics were used: the arithmetic mean value and its degree of freedom were calculated using the Microsoft Office 2003 software package (Microsoft Excel) [8,9].

Results of studies in the preoperative and intraoperative periods.

The results were obtained before and after sedative premedication, 30 minutes after the surgical procedure and at the end after completion. Before the start of premedication in the CG, the average parameters of AD were: systolic was 122±4, diastolic reached a digital value of 80±4 mm.rt.st, heart rate was determined to be



78±6 ud/min (Fig. 1).

Fig. 1 Average blood pressure values before premedication, (M±m)

The obtained hemodynamic results established: hypertension I st: systemic pressure 143±4 mm.rt.st., diastolic pressure was 92±4 mm.rt.st; heart rate increased to values of: 87±4 beats/min. hypertension II st: systemic pressure 149±4 mm.rt.st., diastolic pressure was 99±5 mm.rt.st;, heart rate increased to 94±4 beats/min. The

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indicator of statistical significance (P) ≤ 5% in contrast to arterial hypertension and more than 5% of heart rate figures.The use of sedative premedication with Novopassit improved the values of cardiovascular function after a few minutes (Fig.(Fig.2 2, Table 3) .

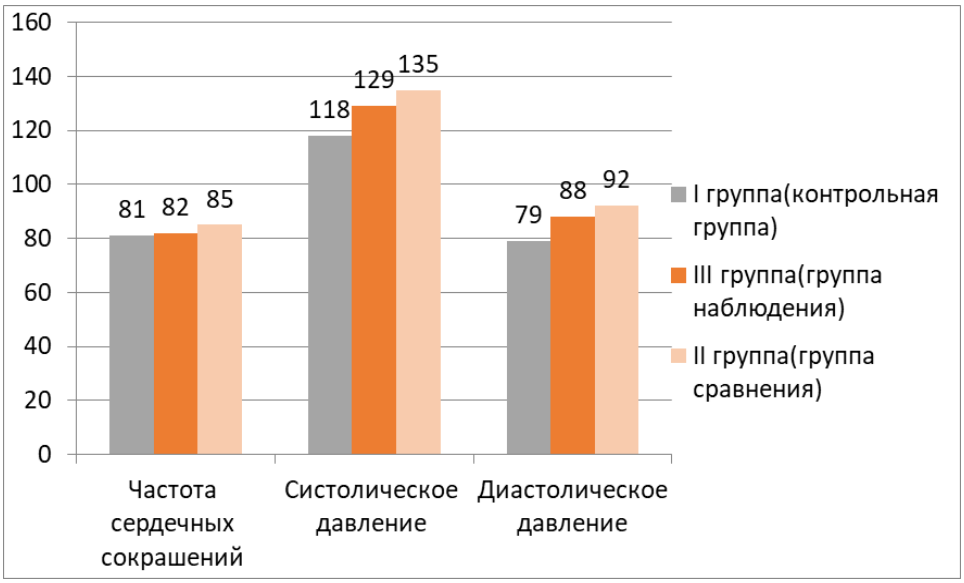

Fig. 2 Average hemodynamic parameters after premedication (M±m, P)

Table 3
Hemodynamics after premedication, (M±m, P)

	АД, mm.rt. st		Heart rate, bpm
AG	**Sistolik**	**Diastolik**	
I	129±3; P<0,05	88±5; P < 0,05	82±4, P >0,05
II	135±4; p < 0,05	92±4; P < 0,05	85±2, P > 0,05
III	*	*	*
Control group	118±4	79±3	81±2

* - the study was not conducted in these patients
P - significance level compared to the control group

Analysis of mean hemodynamic values after sedative premedication using Novopassit in the control group systolic pressure was 118±4 mm.rt.st., diastolic pressure was 74±6 mm.rt.st, P>0.05, SS frequency was 75±5 ud/min. In patients with the specified pathology I st: systolic pressure was 123±4 mm.rt.st., diastolic pressure was 86±4 mm.rt.st, SS frequency was 73±2 ud/min. In cases of Hupertension -P: systolic pressure was 130±5 mm.rt.st., diastolic pressure was 87±5 mm.rt.st, at a reliability level of P>0.05, SS frequency was 80±5 ud/min.

The key moment of osseointegration is the formation of a blood clot, i.e. a valuable study of this issue is the quality of blood flow, determined by UDF examination.

The blood flow velocity in patients with grade 1 background pathology was 0.67±0.01 sm/sec and differed from the KG values by 15%. In clinical situations with VA with grade 2 hypertension after premedication it was 0.70±0.013 (with a difference of 23% from the KG).

The assessment of the volumetric velocity (average value) in all examined groups with grade 1 hypertension was 0.0074±0.005 ml/sec in comparison with the KG by 28%, with grade 2 background pathology it was 0.0065±0.0003 ml/sec the difference with the KG was 37%.

Summing up this stage of the examination, we believe that we can put forward a hypothesis that with the aggravation of the severity of the hypertension disease in the dental status, significant pathological shifts in blood flow parameters are observed. A significant decrease in the linear and volumetric blood flow velocities

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and redistribution of blood flow towards arteriovenous shunts is emphasized. (табл. № 4).

Table 4

Blood flow values UDF in the implantation site (M±m, P)

Study groups	Gosling Index (PI)	ОСК (мл/sек)	СЛСК (VAM),см/сек
АГ I	2,165±0,03 P > 0,05	0,0073±0,0005 P < 0,005	0,47±0,023 P < 0,005
АГ II	2,147±0,05 P > 0,05	0,0064±0,0003 P < 0,005	0,42±0,025 P < 0,005
АГ III	1,994±0,09 P = 0,05	0,0049±0,0003 P < 0,005	0,40±0,013 P < 0,005
Контроль	2,178±0,009	1,008±0,003	0,87±0,014

АГ - Артериальная гипертензия

In the list of laboratory tests for patients with concomitant diseases with cardiovascular disease and hypertension, blood biochemistry is undoubtedly of interest: total cholesterol, LDL and HDL [4, 10, 12, 13].

In cases with hypertension stage I and II in groups 2 and 3 of subjects, the total cholesterol level in the blood was 5.88±1.36; 6.24±1.12 and 5.45±1.46; 6.25±1.33 mmol/liter (physiological norm). In patients with hypertension stage III, the levels were 6.24±1.23 and 6.72±1.31 mmol/liter, the digital values exceeding the physical norm. This fact indicates the presence of atherosclerosis in the vessels.

The control group LDL had a value of 3.8±1.14 mmol/liter. High-density lipoproteins in patients with the pathology under study looked like this: Arterial hupertension I - 1.54±0.25 mm/litr; Arterial hupertension II -1.14±0.32 mm/litr and Arterial hupertension III - 1.09±0.28 mm/litr. In the CG, VP lipoproteins were 1.92±0.41 mm/litr mm/litr.

The HDL fraction transports cholesterol from organs and tissues to the liver, where the fraction is utilized.

According to the results of our data, activation of the blood coagulation system and biochemical blood parameters in the study groups was noted, compared with the CG, over 15% was obtained, statistical differences in the parameters were reliably significant in all groups.

Study groups	**Total cholesterol, mmol/liter**		**Cholesterol - LDL, mmol/liter**		**HDL cholesterol, mmol/liter**	
AG(suggestions)						
I	5,91±1,34	P > 0,05	3,93±1,17	P > 0,05	1,53±0,24	P > 0,05
II	6,13±1,11	P > 0,05	4,21±1,09	P >0,05	1,12±0,31	P > 0,05
III	6,24±1,21	P > 0,05	4,78±1,16	P > 0,05	1,08±0,27	P > 0,05
AG(suggestions)						
I	5,81±1,46	P > 0,05	4,05±1,12	P > 0,05	1,49±0,39	P > 0,05
II	6,24±1,31	P > 0,05	4,18±1,15	P > 0,05	1,26±0,44	P > 0,05
Control	5,46±1,23		3,8±1,14		1,9±0,4	

Analysis and assessment of the bone-implant bed condition, bone tissue resorption in the circumference of the installed DI was carried out within 7 days after DI, immediately after fitting the crowns or bridge prosthesis,

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3-6 months after dental prosthetics, the final radiograph after one year.
The area of the necks of the inserted DI in patients of the Control group after 7 days showed some resorption, its average value was 0.4 ± 0.2 mm;
The similarity of this phenomenon was present in all groups, and it is also necessary to take into account that there is statistical insignificance, amounting to P < 0.05. Thus, Arterial hupertension I st and II st data were approximately 0.6 ± 0.3 mm.
We consider the success of the work performed to be that by the time of installation of orthopedic structures on artificial supports, in all the studied groups, horizontal and vertical bone resorption around the interface was noted insignificantly in the clinical aspect, and sometimes was absent altogether. Such examples are the photo-drawings of patients presented below. (See Fig. 1, 2, 3).

The results of the observation indicate that one year after the orthopedic treatment, in all the study groups, not a single case of bone resorption in the area of the implants was detected.

By the time of installation of orthopedic structures supported by the installed implants, in all the observed groups, horizontal and vertical bone resorption in the area of the implants was clinically insignificant or absent.

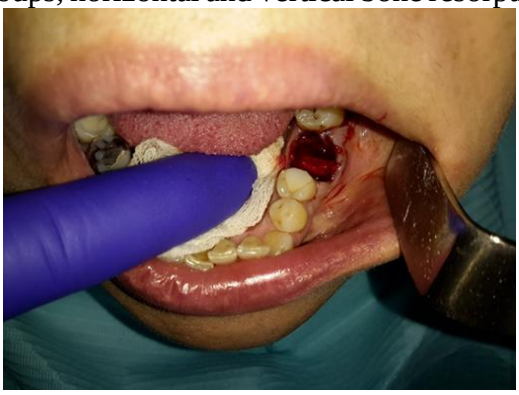

Fig. 1. Patient of group 1 after removal of tooth 36

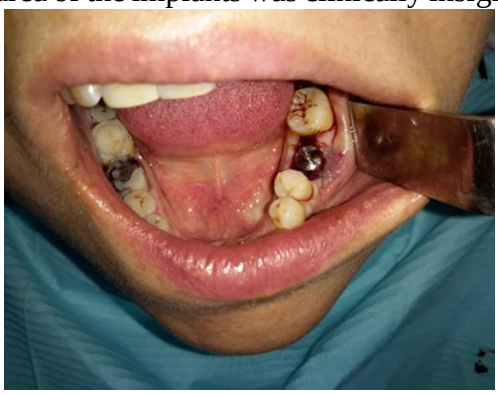

Рис. 2 Patient after installation of a gingivalformer

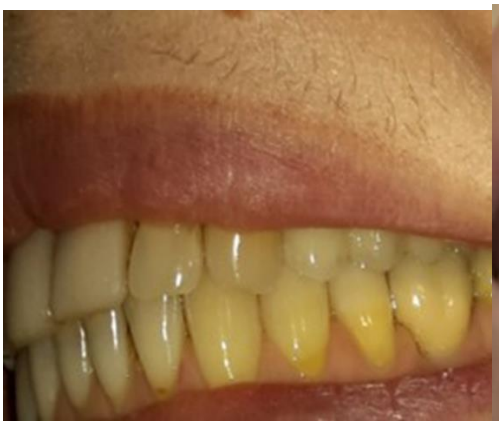

Fig. 3 Patient at the stage of orthopedic rehabilitation

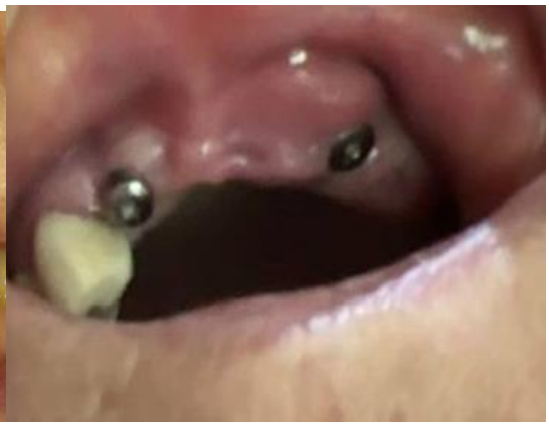

Fig. 4. Patient of the 2nd group installation of a gum former

Fig. **3** Patient at the stage of orthopedic Fig. **4**. Patient of the 2nd group installation of a gum former rehabilitationю.

After a 6-month interval of completed treatment, bone resorption was not observed on radiographs, both in the Control group and in the others. According to the remote results, a 2-year interval of implantation, in 30% of Control group patients, the average value was about 0.7 ± 0.1 mm.

The average value of resorption near the necks of the installed structures was 1.3 ± 0.2 mm in patients with CVA and Arterial Hupertension in 55% of cases, and it should be noted without an obvious dependence on the severity of the disease.

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We believe that horizontal resorption of bone ICI with a depth of no more than 1.5 mm in a 2-year period after installation can be considered physiologically norm and there will be no negative process in the prognosis.

Conclusions.

1. Precise criteria for conducting DI have been developed, which consist in the possibility of conducting implantological treatment only in situations of hypertension of I and II degrees of severity, first and second functional classes.
2. It has been proven that the blood flow in the microcirculatory bed in the implantation bed area slows down, which indicates a negative impact on the osseointegration process. The blood flow velocity in subjects with hypertension of stage I was 0.64 ± 0.025 cm / sec, differing by 16% in comparison with the control group. For subjects of stage II with background pathology, the data were estimated as 0.69 ± 0.024 with a difference of - 21%.
3. In patients with VA with hypertension of I and II, the determination of periotestometry in the area of the inserted dental implants after 6 months was -4.8 ± 0.2 and -4.4 ± 0.6. In the group with the proposed preoperative preparation tactics, the periotestometry index had an average value-5,5±0,3, upper jaw 6-8 months, lower jaw c 3-6 months.

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