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Improvement of Mucogingival Osteoplasty Effectiveness in the Treatment of Patients with Severe Generalized Periodontitis by Means of Periosteum Multiple Penetration

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Abstract.

Periodontal diseases take the lead among all dental diseases. The severity of the disease, frequent relapses and complications lead to the decrease in patients' quality of life, difficulty in mastication and speech pathology, significant social and economic loss. Classical periodontal Cieszyński-Widmann-Neumann surgery in modern interpretations solves many problems in the treatment of patients with generalized periodontitis of II-III stage. However, a number of issues including the use of periosteum ossific function for osteoregeneration require improvement. Therefore, new treatment regimens should be developed.

The objective of the research was to develop an effective method of bone repair and to determine its effectiveness in the surgical treatment of patients with generalized periodontitis of II-III stage by improving Cieszyński-Widmann-Neumann surgery. Radiological, echoosteometric research methods, index assessment of periodontium state, roentgenomorphometric indices were used.

The developed method of periosteum multiple penetration promotes bone formation as evidenced by radiological and osteometric research results. Under the influence of the developed treatment the positive dynamics of index assessment of periodontium state was observed. Periosteum multiple penetration improves mucogingival osteoplasty effectiveness in patients with generalized periodontitis of II-III stage.



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Problem statement and analysis of the recent research

Despite the significant number of scientific works and practical recommendations on the treatment of generalized periodontitis, researches regarding generalized periodontitis of II and III stage treatment and issues on interrelation of periosteum tissue and inflammation and density of the bone structure of the jaw bones are not sufficient [2, 3, 4, 5, 6, 7, 8].

The objective of the research was to develop an effective method of bone repair and to determine its effectiveness in the surgical treatment of patients with generalized periodontitis (GP) of II-III stage by improving Cieszyński-Widmann-Neumann surgery.

Materials and methods of the research

43 patients with GP of II-III stage at the age of 20 to 60 (20 men and 23 women) were involved into the research. Depending on the method of surgical treatment, all patients were divided into two groups. Group I included 20 patients to who underwent Cieszyński-Widmann-Neumann surgery as a method of surgical treatment. Group II consisted of 23 patients who underwent multiple penetration of periosteum in addition to Cieszyński-Widmann-Neumann flap surgery.

We proposed and developed a method of multiple penetrations of periosteum to improve osteoreparation processes. The developed method lies in the fact that during the flap surgery after its detachment periosteum is penetrated with ball-shaped burr forming holes with a distance of 2-3 mm.

The loss of the dentogingival epithelial junction (LDEA) was determined using a graduated periodontal probe in mm calculating the average according to the measurements in four points around each tooth by the technique of G.F. Biloklytska (2010) [12].

Osteoplastic material based on hydroxyapatite was placed into the bone pocket and in ridge bone during the flap surgery.

Radiological, echoosteometric research methods, index assessment of periodontium state, roentgenomorphometric indices were used before and after the surgery in the dynamics.

Statistical processing of digital material was conducted to determine the probability of the results.

The patients' examination was conducted before the surgery and in 1, 6, 12 months after the surgery.

Antibiotics were administered for 7 days to inhibit microflora in periodontal pockets and to reduce inflammation in periodontium during the preoperative preparation of patients with GP of II-III stage. The general therapy agents included analgesics, antihistamines, probiotics, and desensitizers. The prescription was individualized depending on the severity of inflammatory changes and overall health. Patients were taught oral hygiene and informed about the means of good hygiene.

Prosthetic preparation consisted in elimination of the factors causing periodontal functional overload. In case of periodontal functional overload detection patients were recommended to replace dental protheses or to have orthodontic appliances made. The selective grinding was conducted by diamond drill according to the method of B. A. Jankelson (1979). Ground tooth surface was covered with fluorine varnish. Orthopedists conducted permanent and temporary teeth splinting.

Results of the research

24 (56%) patients of the Group I (Table 1) and 19 (44%) patients of Group II (Table 2) complained of pain of varying intensity at the site of surgical intervention in the postoperative period. These manifestations lasted from 1 to 3 days in both groups. These painful sensations in patients were neutralized after the prescription of pain medication.

Table 1

The characteristics of periodontal clinical status in patients of Group 1

Indices	Preoperative period	Postoperative period		
		1 month	6 months	1 year
Bleeding gums (% of patients)	80.0±6.3%	-	15.0±7.5%	17.5±7.7%
Edema (% of patients)	67.5±7.4%	-	25.0±6.9%	35.0±7.5%
Fluid in the pockets (% of patients)	75.0±6.9%	38.0±7.8%	55.0±7.9%	47.5±7.9%
Tooth mobility (% of patients)	70.0±7.3%	-	35.0±7.5%	47.5±7.9%
Loss of soft tissue height (mm)	-	1.01±0.05	2.0±0.13	2.5±0.21
Pocket depth (mm)	8.9±0.4	-	1.1±0.1	1.5±0.15

Low-grade fever was observed in 5 patients of Group I (11.6%) and in 3 patients of Group II (7%) on the first day after the surgery. Condition of all the patients was satisfactory in 15-16 days after the operation; they did not make any complaints. Mucoperiosteal flaps were kept in the new position on the sixteenth day after the surgery. No signs of inflammation were noticed. Gums became pink, did not bleed, and tightly covered the teeth, swelling and redness was not observed.

Inequality of provided material density and decrease in its levels in the patients of the Group I to 2.2 ± 0.01 mm and within 1 mm in the patients of Group II, a slight decrease in granularity of implanted material on the edge of the adjacent bone tissue in both groups was observed during X-ray examination 1 month after surgical treatment.

Table 2

The characteristics of periodontal clinical status in patients of Group 2

Indices	Preoperative period	Postoperative period		
		1 month	6 months	1 year
Bleeding gums (% of patients)	80.6±6.6%	-	12.2±6.9%	14.0±7.2%
Edema (% of patients)	77.8±6.9%	-	8.3±4.6%	11.1±5.2%
Fluid in the pockets (% of patients)	77.8±6.9%	13.9%	27.8±6.9%	25.0±7.2%
Tooth mobility (% of patients)	72.2±7.5%	-	-	8.3±4.6%
Loss of soft tissue height (mm)	-	0.5±0.05	1.0±0.08	1.5±0.10
Pocket depth (mm)	9.26±0.3	0.0±0.0	0.0±0.0	1.1±0.15

Reduction of radiological density and decrease in the level of provided material to 2.8 ± 0.01 mm in patients of Group I and to 1.3 ± 0.01 mm in patients of Group II on the tops of alveolar bone in all areas was observed in 6 months after the surgery using enlargement X-ray. Small spaces between the implanted material and the teeth roots appeared. Despite low-grade granularity in individual areas, osteoplastic material had already lost the high radiological density and former separation with bone tissue.

1 year after surgical treatment using enlargement X-ray we observed topical reduction of alveolar bone height in comparison with the modeled one during surgery, namely by 3.0 ± 0.01 mm in the areas of lower incisors, by 2.7 ± 0.01 mm in the areas of the upper incisors and premolars, by 3.5 ± 0.01 mm in the areas of upper and lower molars in Group I; and by 1.8 mm in areas of lower incisors, by 1.51 mm in areas of lower molars, by 1.84 mm in areas of the upper incisors, by 1.12 mm in areas of upper premolars and by 1.18 mm in areas of upper molars in Group II.

Radiologically, cortical plate in the patients of Group II was observed more significantly than in the patients of Group I. The difference was particularly observed in areas of lower molars where cortical plate on the tops of alveolar bone was slightly visible.

The results of periodontal assessment index in both groups are presented in Fig.1. and Fig.2.

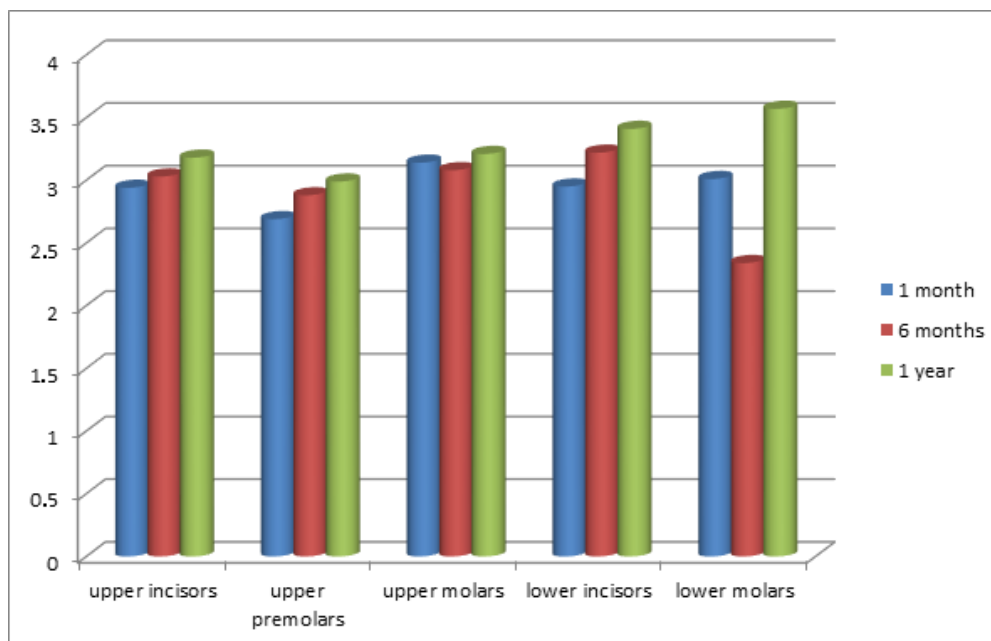


Fig. 1. The iodine absorption number by Svrakov in patients of Group I in the postoperative period

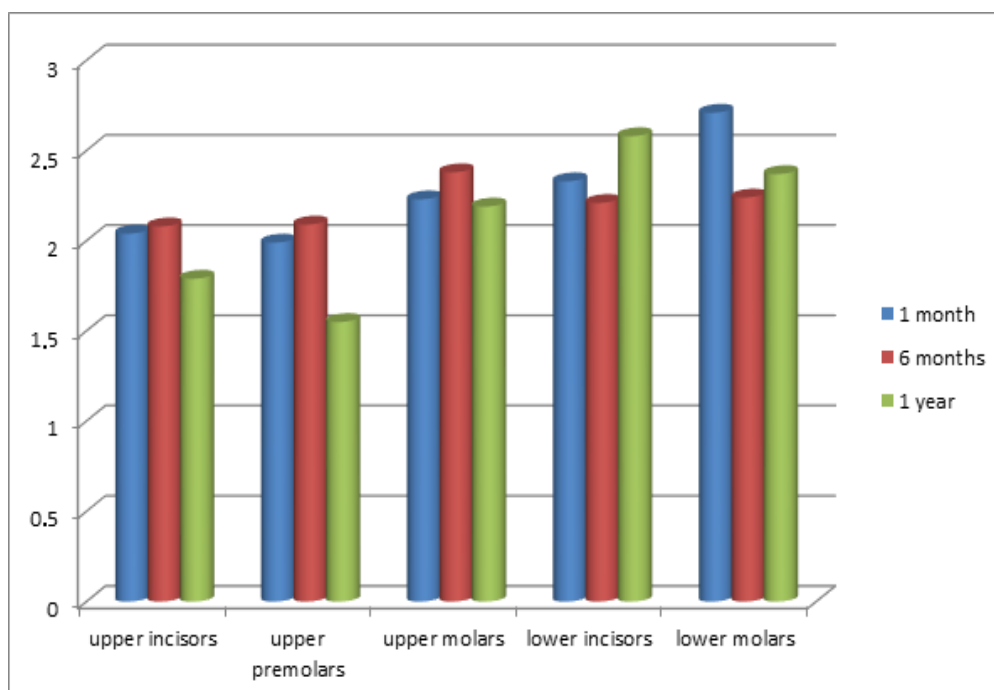


Fig. 2. The iodine absorption number by Svrakov in patients of Group II in the postoperative period

Combined periodontal index (PI) was used to determine the severity of dystrophic and inflammatory changes in periodontal tissues. Moreover, inflammation severity, the degree of, CT destruction presented on a scale from 0 to 8 was taken into account.

Periodontal index constituted 5.63 ± 1.11 in patients of Group I and 5.69 ± 1.23 in patients of Group II before the operation. 1 year after the operation it constituted 4.11 ± 0.81 in patients of Group I and 3.18 ± 0.89 in patients of Group II. This indicator showed a longer stabilization process in the patients of Group II.

LDEA constituted 4.5 ± 1.20 in the patients of Group I and 4.45 ± 1.18 in the patients of Group II in 1 month. LDEA indices amounted 4.40 ± 1.12 in Group I patients and 4.43 ± 1.20 in Group II patients in 60 days. In a year, the indices constituted 4.30 ± 1.19 in the patients of Group I and 4.40 ± 1.16 in the patients of Group II indicating more stable positive results in patients of Group II.

Index assessment of periodontium state indicated the effectiveness and benefits of the developed method of periosteal perforation.

The developed method of periosteum multiple perforation has not only osteogenic effect, but also anti-inflammatory one being indicated by anti-inflammatory periodontal indices.

The analysis of roentgenomorphometric indices in patients with GP of II - III stage detected a reliable increase in the mandibular body height: 18.87 ± 0.44 mm in patients of Group II in comparison with 17.08 ± 0.23 mm in patients of Group I. At the same time tendency to increase in the alveolar bone height (13.64 ± 0.43 mm and 14.36 ± 0.25 mm, respectively) was detected.

Discussion of the results

The results of research obtained in the patients of Group II were significantly different from the results of Group I patients after 6 months of surgical treatment and the positive effect increased in the dynamics. This can be explained by the stability of the dentogingival epithelial junction, active processes of reparative osteogenesis caused by healing of penetrated periosteum. Such effect was confirmed by the research of Professor V.V. Malanchuk.

Thus, according to the above mentioned data it may be concluded that the use of periosteal penetrations has advantages over the traditional method of surgical treatment of patients with severe form of generalized periodontitis and consists in the reduction of teeth mobility, in radiological precision of bone trabecula of alveolar bone. Comparison of the research results of Group I and II patients confirm the effectiveness and appropriateness of the developed method use in the treatment of patients with severe generalized periodontitis. Periodontal indices allow concluding that we have developed a method of periosteum multiple penetrations providing not only osteogenic effect, but also anti-inflammatory effect.

Conclusions

1. The developed method of periosteum multiple penetrations promotes bone formation being evidenced by radiological analysis and osteometric research results.
2. Under the influence of the developed treatment the positive dynamics of index assessment of periodontium state was observed: iodine absorption number by Svrakov constituted 6.55 ± 0.25 in the patients of Group I in the preoperative period and 7.22 ± 0.24 in the patients of Group II. 1 year after the surgery it amounted 3.27 ± 0.26 in the patients of Group I and 2.10 ± 0.18 in the patients of Group II. PI before the surgery constituted 5.63 ± 1.11 in Group I patients and 5.69 ± 1.23 in Group II patients. 1 year after the surgery the indices constituted 4.11 ± 0.81 in the patients of Group I and 3.18 ± 0.89 in the patients of Group II.
3. Periosteum multiple penetration increases the effectiveness of mucogingival osteoplasty in patients with GP of II-III stage.

The prospects for further research involve comparative analysis of surgical treatment effectiveness combined with medication allowing to obtain more stable positive result in treatment of patients with GP of II-III stage.

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