



Prospects of Dental Implants Placement in Cases of Periodontal Disease*

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ABSTRACT

Purpose.

Determining the effectiveness of Pierre Fabre Oral Care (French laboratory) hygienic remedies of oral care after conducting all stages of dental implantation in cases with periodontitis.

Methods.

A survey was held on 65 patients, divided into 2 observation groups: 33 patients with periodontal disease (chronic generalized periodontitis of mild and moderate severity), which during four weeks (one month) after dental implant installation were conducting hygienic care of oral cavity using remedies of Pierre Fabre Oral Care laboratory and 32 patients without periodontal disease and other accompanying diseases (practically healthy people), which next day after dental implant installation started doing hygienic care of oral cavity using traditional oral care products for duration of one month.

Results.

Based on acquired data, hygienic oral care using Pierre Fabre Oral Care laboratory products has proven to be effective in cases with periodontal disease after conducting surgical stage of dental implantation, which allowed reducing the amount of postoperative inflammatory complications.

Conclusion.

It is recommended to use hygienic oral care products of Pierre Fabre Oral Care laboratory after conducting dental implantation to prevent the occurrence of early and late inflammatory complications.

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Introduction

Some of the relative local contraindications to dental implantation are periodontal diseases (periodontitis, gingivitis) and unsatisfactory oral hygiene, which is often present in cases with given pathology. Most frequent complication, which may appear in postoperative period in cases of periodontal disease is peri-implantitis. Frequency of complications, which appear after dental implantation, based on authors, is from 0.4% to 5% [1-7].

Success of dental implantation, after completion of its surgical stage, is possible only if the patient is correctly conducting oral care hygienic procedures in postoperative period. The lifespan of dental implants is affected by thorough abundance of oral hygiene similar to

one after surgical stage of dental implantation.

Metal dentures, fixed on dental implants, take part in electrochemical reactions and may be affected by corrosion, which slows regenerative processes of bone tissue in regions of conducted implantation and contributes to the development of postimplantation complications (Tymofiev, 2005; Tymofiev, Pavlenko, 2007; et al.).

In conditions of oral cavity metallic implants and their supraconstruction, as also non-removable metallic dentures, are entering an electrochemical reaction. Resulting difference in electrogalvanic potentials between metallic elements (implant, suprastructure, dentures) leads to formation of electric current, which is accompanied by release of products of electrolysis of metal alloys into the oral fluid with the spread and accumulation of them in the patient's body (Onischenko, 1995; Ilyk, 1999; Kordiyak, 2001; Leonenko, 2003; Tymofiev, 2006, et al.).

Usage of metallic dental implants with metallic contents (abutment, denture) in some cases may lead to development of complications in form of certain

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clinical forms of intolerance (galvanosis) of metal alloys of dentures (galvanic, allergic, reflex, toxic or combined) or galvanism. In the galvanic and reflex form of intolerance to metal alloys, galvanic currents are the main active factor, in the case of allergic and toxic – the products of electrolysis of metal alloys, and when combined – galvanic currents and electrolysis products to the same extent. In cases of galvanism, there is no clinical symptomatology of the disease with significantly increased potentiometric parameters, which lead to the development of local complications in the oral cavity.

The purpose of the study is to determine the effectiveness of oral care hygiene products of the French laboratory Pierre Fabre Oral Care after all stages of dental implantation in cases with periodontal disease.

Material and Methods

The examination was carried out on 65 patients, which were divided into 2 observation groups:

- main group – that is 33 patients with periodontal disease (chronic generalized periodontitis of mild and moderate severity) who, after setting dental implants for four weeks (one month), performed hygienic oral care with Pierre Fabre Oral Care (Pierre Fabre Pharmaceuticals, France);

- control group – 32 patients without periodontal disease and other local concomitant diseases (practically healthy people) which on the next day after the completion of the surgical stage of dental implantation performed oral hygiene with traditional care products for one month.

In all examined cases, we used dental implants (Alpha Bio system, Israel).

In the first observation group for oral hygiene we used products of the French laboratory Pierre Fabre Oral Care.

“Eludril®” is an antiseptic solution for mouth rinsing. 100 ml of the solution contains 0.5 ml (0.1%) of chlorhexidine digluconate and 0.5 g (0.5%) of chlorobutanol hemihydrate. Chlorhexidine digluconate has a bactericidal (wide active spectrum) and fungicidal action, also helps to remove dental plaque. The drug also contains sodium docusate, which prevents chlorhexidine from rinsing off the surface of the oral mucosa. The duration of the action is 8 hours. Chlorobutanol enhances the action of chlorhexidine and has a local analgesic effect.

“Elgidium clinics®” toothbrushes are designed for cleaning teeth several hours after the completion of surgery and until the complete healing of the postoperative wound. These toothbrushes are represented by three of their kind: postoperative (indicated by the numbers 7/100) – is intended for gentle massage of the gums and cleansing of the teeth within 7-10 days after surgery; surgical (indicated by

the numbers 15/100) – for a gradual return to normal tooth cleaning (used more often on the 7-10th day after surgery for the next two weeks); soft (can be indicated by the numbers 20/100) – used for daily brushing of teeth in the future.

When brushing the teeth (morning and evening), we recommended patients of the first group to use the toothpaste “Elgidium®” (antibacterial paste with chlorhexidine, 25% calcium carbonate and Irish moss). Toothpaste easily eliminates dental plaque and has anti-inflammatory and hemostatic effects. Patients brushed their teeth for 2-3 minutes twice a day.

“Elgidium trio compact®” mini-brushes are used to provide maximum hygiene in hard-to-reach areas between the teeth. The interdental toothbrushes (wide and narrow) are equipped with three replaceable brushes. A set of brushes with fibers of different diameters for wide interdental spaces consists of a microfiber of cylindrical shape with a diameter of 1.9 mm, thin fibers of a conical shape with a diameter of 4-3 mm, wide fibers of a conical shape with a diameter of 5-4 mm. A set of brushes with fibers of different diameters for narrow interdental spaces consists of a microfiber of cylindrical shape with a diameter of 1.9 mm, microfibers of a conical shape with a diameter of 2.7-2.5 mm, wide fibers of a conical shape 3.5-2.7 mm in diameter. Each kit contains two identical cartridges, one of which is a spare one. For the patient, only one set is needed with the required fiber diameter (indicated on the package in a colored circle). The set of brushes can be with fibers of the same diameter (for narrow or wide interdental spaces). The color of the circle in which the diameter value is indicated corresponds to the color of the mini brush that is fixed in the cartridge. Mini-brushes have an ultrathin rod, which easily bends and facilitates cleaning in hard-to-reach areas. Protective cartridge-handle allows compact and reliable storage of brushes. The interdental brush is inserted into the interdental space perpendicular to the tooth surface and moved by shifting movements inward and outward. Microfibers easily clean the interdental spaces.

To prevent the development of inflammatory complications after the surgical stage of dental implantation, the antiseptic periodontal gel “Elugel®” was used in the first observation group, which contains 0.2% chlorhexidine digluconate (has antibacterial properties and fungicidal action) and sodium hydroxide (changes the pH of saliva to alkaline side, which can replace soda rinses). After rinsing with Eludril, periodontal gel was applied in the morning to the suture material (postoperative wound), gum and teeth for 7-10 days. In the evening, for 7-10 days after the surgical stage of dental implantation, the applique of the gel with rhubarb extract – “Parodium®”, which contains 0.02% chlorhexidine digluconate (prophylactic dose), 0.2% rhubarb root extract and 0.00067% formaldehyde, was applied to the postoperative wound. Parodium has a

hemostatic and deodorant effect.

On all observed patients conventional clinical methods of examination were conducted: finding complaints, collecting anamnesis, examining the maxillofacial region and palpation of regional lymph nodes, examining the oral cavity, palpating the gums, percussion of the teeth, determining the mobility of teeth and the depth of the dentogingival pockets, radiography. Given that the patients of the first observation group had periodontal disease (chronic generalized periodontitis of mild and moderate severity), they underwent pathomorphological examinations of gingiva tissues in the areas where the dental implants placement was subsequently carried out. Material for pathohistological examination was taken by excision of soft tissues in their entire thickness during the surgical stage of dental implantation.

Half a year after the fixation of the cermet dentures to the installed dental implants, the patients underwent potentiometric examination. For this purpose we used the automatic digital potentiometer (Pitterling Electronic GmbH μg -potential, Munchen, Germany). All subjects underwent three-time measurement of potentiometric parameters in the same place with calculation of arithmetic mean value. The potentiometric parameters were measured in the following sections (points): between metallic inclusions (M-M); between metallic inclusions and dental implants (M-DI); between the mucosa of the alveolar bone and the dental implant (ABM-DI); between the mucosa of the alveolar bone and the metal of the dental prosthesis (ABM-M). Contact of the electrode of the potentiometer with the dental implant was carried out by touching directly the dental implant (more often in its neck region), if possible, or by carrying out on-bone (in the implant area) potentiometric measurements. An electrode-needle, introduced by Tymofeiev [8], was used to carry out potentiometer potentiometric measurements.

To assess the effectiveness of hygiene products use, survey methods were carried out. The effectiveness of hygiene products was determined by the following indicators: indices of hygiene of the oral cavity OHI-S (indices of oral hygiene – simplified) (Green, Vermilion, 1964); The Schiller-Pisarev test; Papillary-marginal-alveolar index (PMA); Gingivitis indices and plaque indices (PI-Plax Index) by Silness and L e (1964, 1967).

The obtained digital data of laboratory examinations was processed by a conventional variational-statistical method using a personal computer and a package of statistical programs “SPSS 11.0 for Windows” and “Microsoft Excel 2016”. Reliability of the survey results was assessed by Student criteria. Differences were considered significant at $p < 0.05$.

Results

As already mentioned earlier, the patients of the main group were persons with periodontal diseases – chronic

generalized periodontitis [9-13], the main symptoms of which were: chronic inflammation of the gingiva, presence of periodontal pockets, resorption of the bone tissue of the alveolar process, mobility of the teeth. In 17 out of 28 examined cases (60.7%) mild periodontitis was revealed: the depth of the periodontal pockets was less than 3.5 mm, mainly in the interdental space, there was no tooth mobility, their displacement was not expressed. 11 out of 28 patients (39.3%) had periodontitis of moderate severity: the depth of the periodontal (periodontal) pocket to 5 mm, the resorption of the bone tissue of the interdental partitions from 1/3 to 1/2 of their height, the mobility of the teeth was I-II degree, tremes were present, traumatic occlusion was expressed.

During the surgical stage of dental implantation, we took gum pieces for pathomorphological studies. In the cases with periodontal disease, basal cell hyperplasia of the epithelium of the mucosa with inverting growth and the formation of multiple protrusions of its own layer was shown (Fig 1), with violation of cell differentiation and thinning of the epithelial layer. Signs of parakeratosis (Fig 2), acanthosis and edema (Fig 3) have been noted in the epithelium of the mucous membrane of the alveolar bone. In the epithelium, pronounced dystrophic changes and disregeneration of the epithelial layer were observed. With the ulcerative form of chronic gingivitis, the granulation tissue in the gingiva was enlarged (Fig 4). In the presence of exacerbation of the inflammatory process, leukocyte infiltration in the layer of the integumentary flat epithelium of the gingival mucosa and focal destruction of epithelial cells were detected [14-17]. In the papillae of the mucous membrane of the alveolar bone, blood overflow of the vessels of the microvasculature was observed (Fig 5), as well as endothelial proliferation (Fig 6) and vascular thrombosis (Fig 7). There was an edema of intrinsic layer of the mucous membrane of the gum with the dilatation of the vessels of the microvasculature (Fig 8), fibrosis and focal perivascular hyalinosis (Fig 9). The cellular composition of the inflammatory infiltrate in its own layer of the mucosa was represented by the predominance of macrophage cells and eosinophils.

Evaluation of the hygienic Green-Vermillion (OHI-S) index was carried out on 29 primary and 27 control group patients after the surgical stage of treatment. We used the scheme proposed by Lutskaya *et al.* The day before the surgery (dental implantation), i.e. on the eve of the operation (Fig 10), values of this index in the main observation group were 1.83 ± 0.06 conventional units (index score is high), which was assessed as unsatisfactory oral hygiene. In the control group – 1.49 ± 0.15 conventional units (index score is average, and the assessment of oral hygiene is satisfactory) [18-25]. On the 7th day, this index in the main group was 1.11 ± 0.03 units (index score is average, and the assessment of oral hygiene is satisfactory), in the control – 1.21 ± 0.10 conventional units (index score is average, and the assessment of oral hygiene is satisfactory). On the 14th

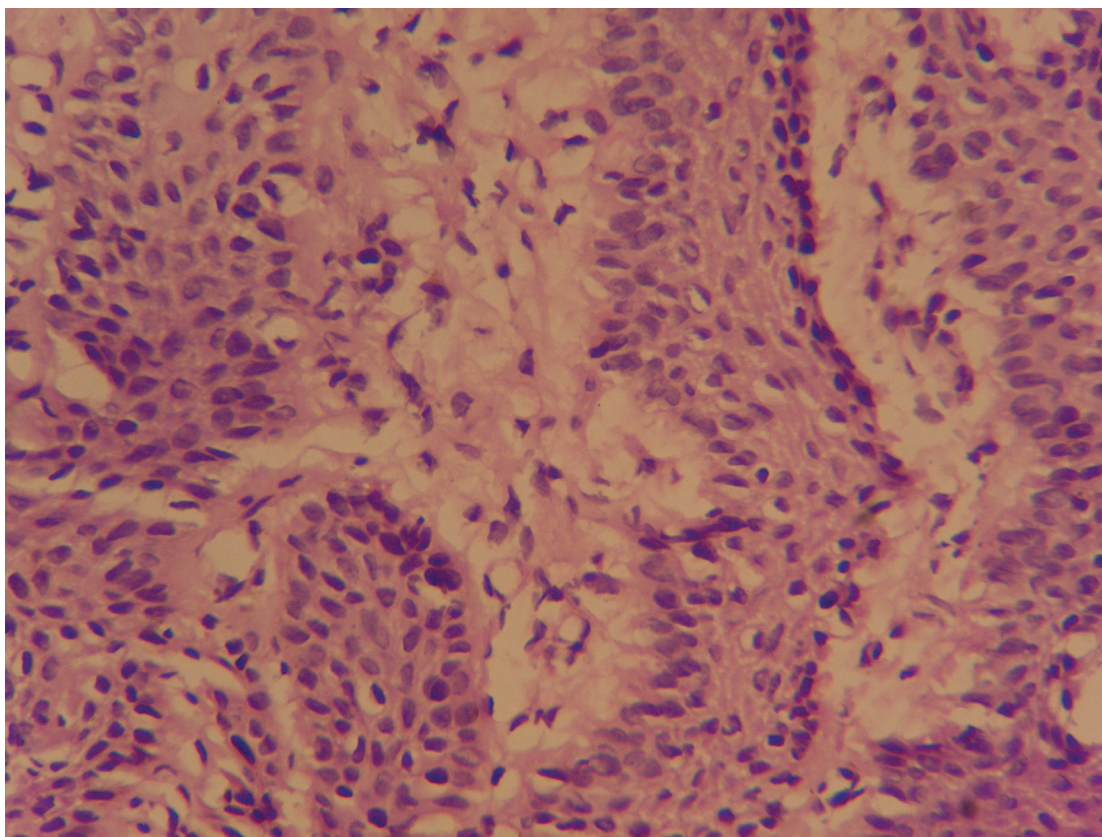


FIGURE 1. Basal cell hyperplasia of the mucosal epithelium with inverting growth and the formation of multiple protrusions of its own layer (hematoxylin and eosin stain, x400).

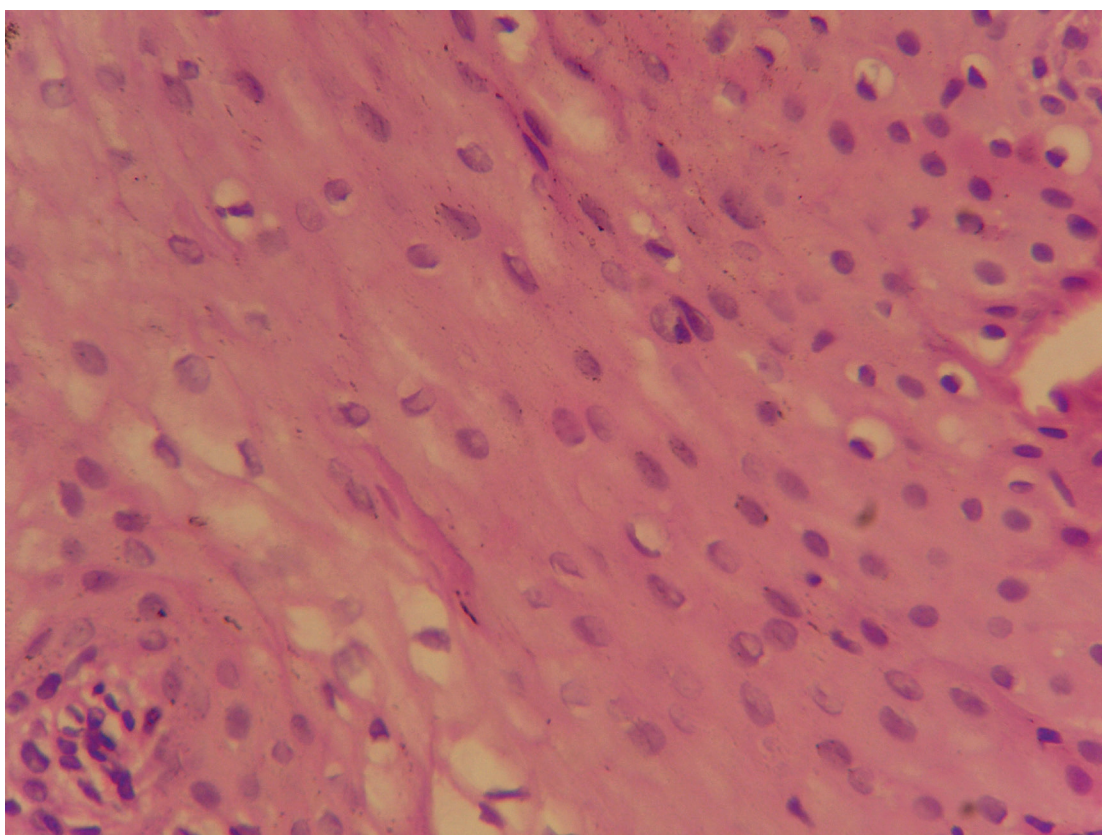


FIGURE 2. Signs of parakeratosis of the mucosal epithelium (hematoxylin and eosin stain, x400).

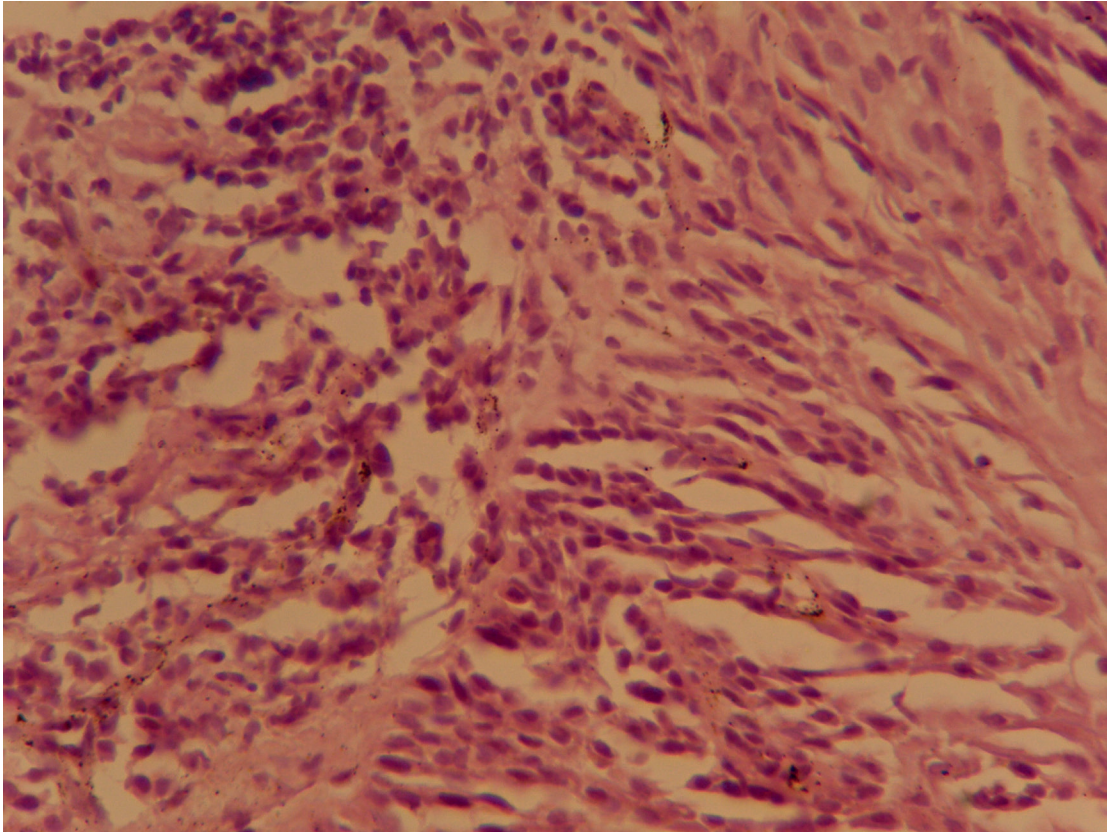


FIGURE 3. Hyperplasia of the mucosa with acanthosis of the cells and edema of the epithelial layer (hematoxylin and eosin stain, x400).

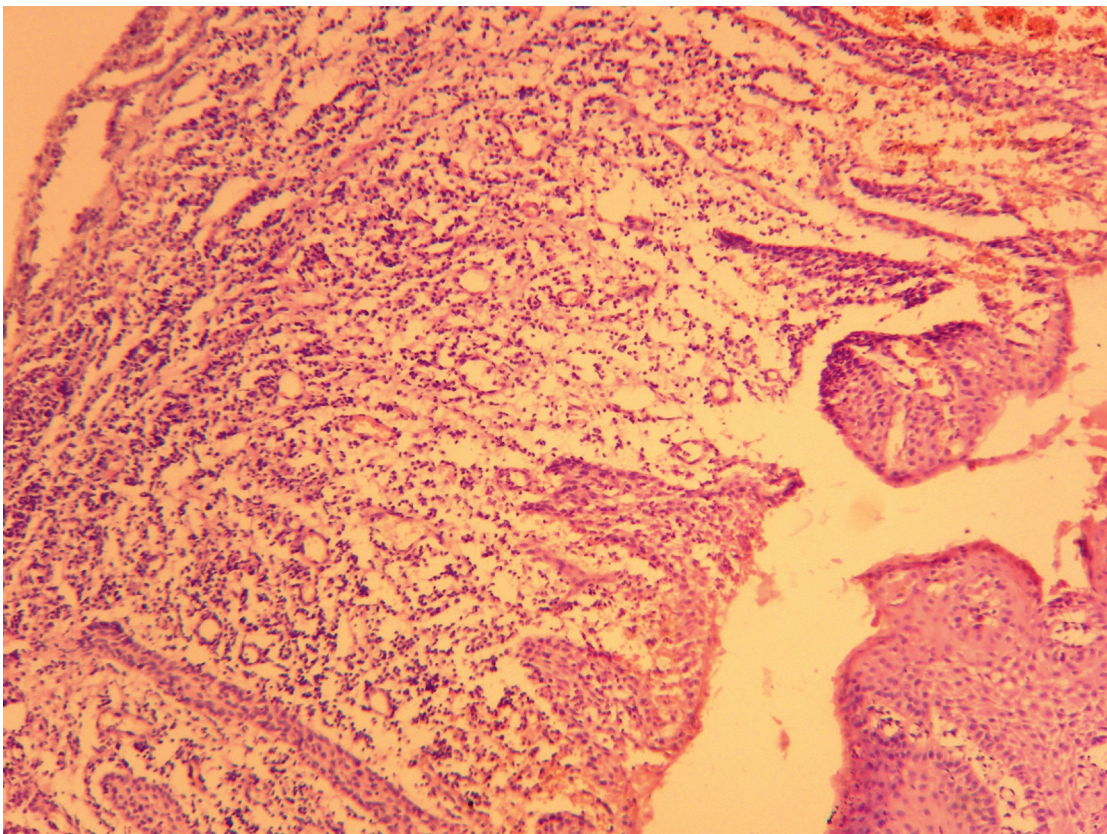


FIGURE 4. Formation of granulation tissue in the gingiva with ulcerative form of chronic gingivitis (hematoxylin and eosin stain, x100).

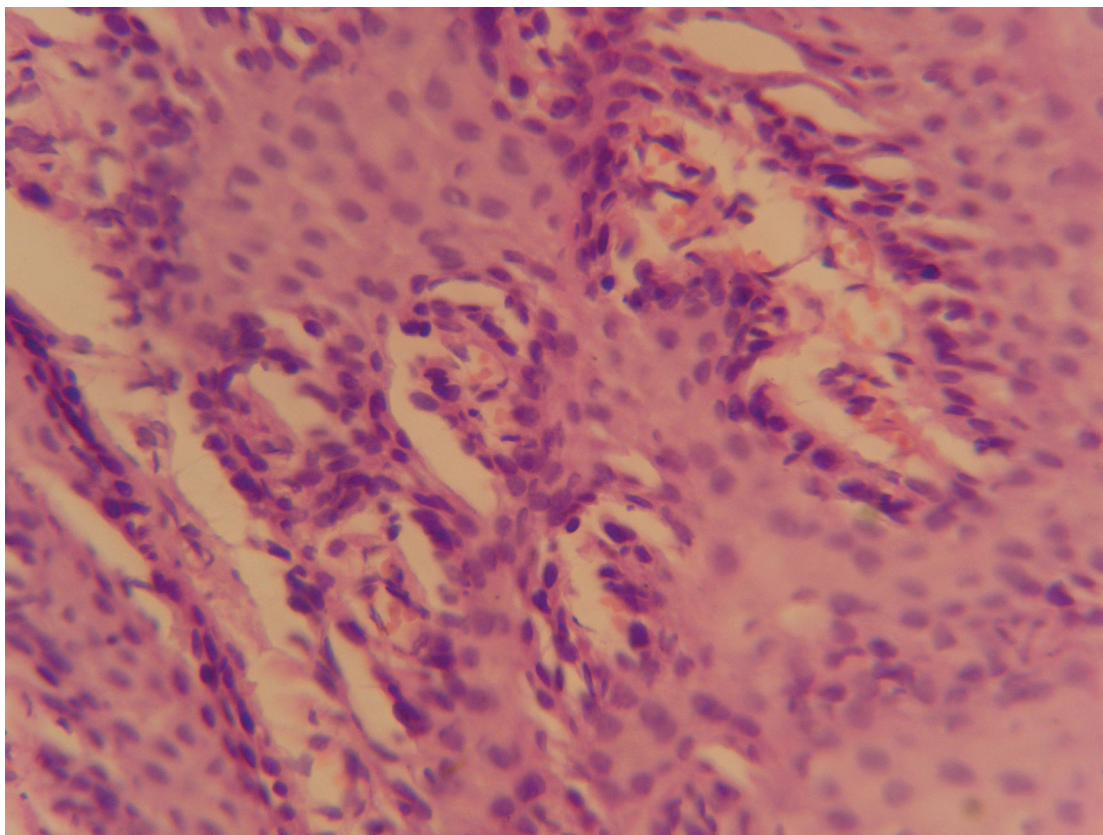


FIGURE 5. Blood overflow of vessels of the microvasculature in the papillae of its own layer of the mucous membrane (hematoxylin and eosin stain, x400).

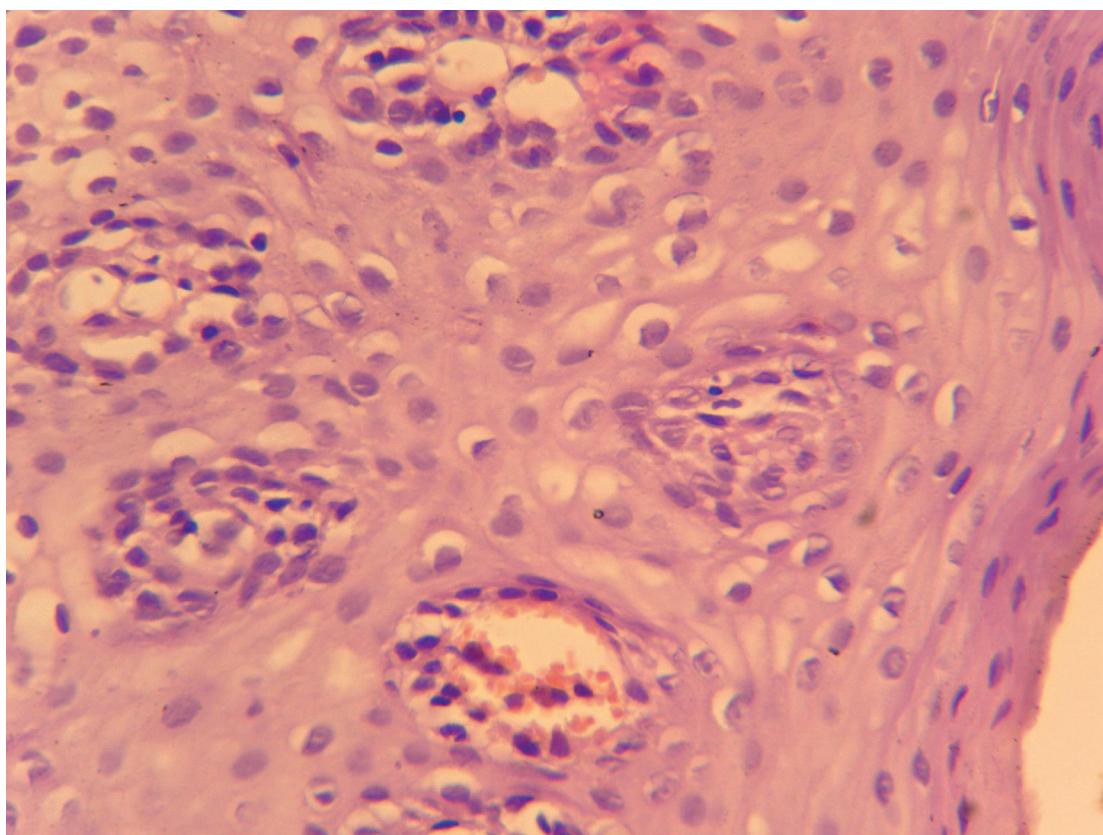


FIGURE 6. Proliferation of the endothelium of the vessels of the microvasculature of the papillae of its own layer of the mucous membrane (hematoxylin and eosin stain, x400).

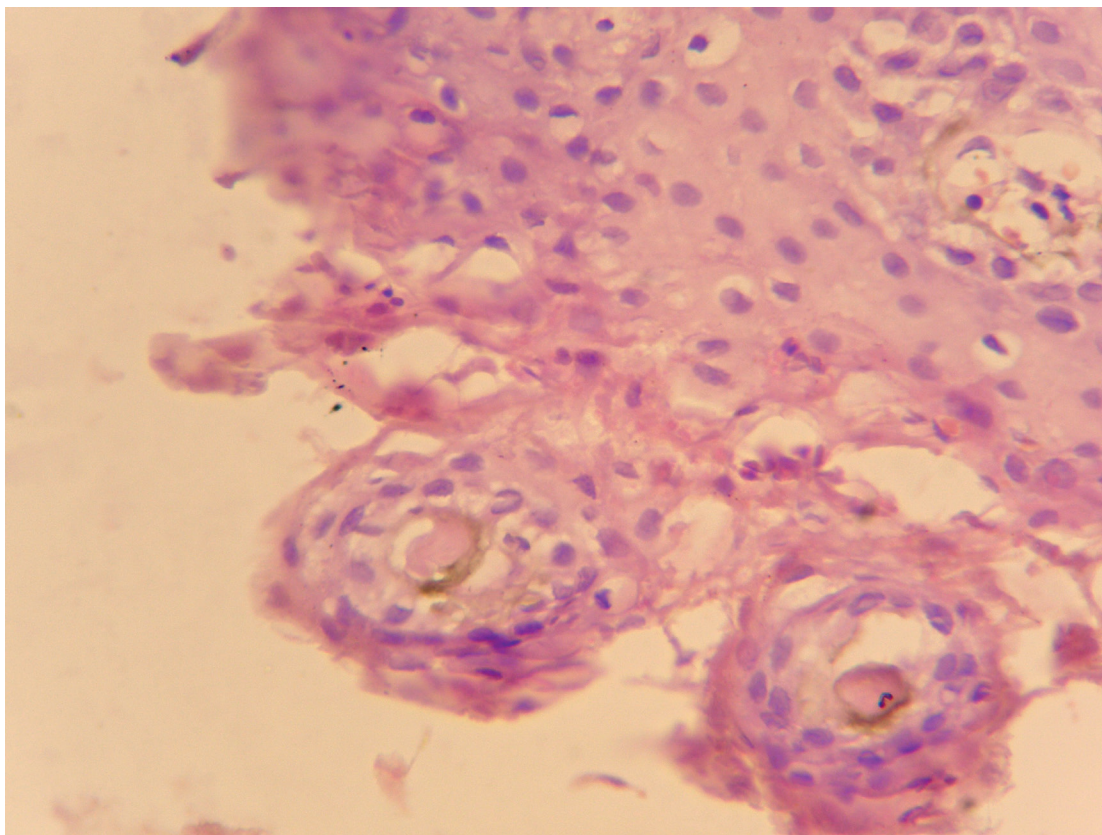


FIGURE 7. Thrombosis of the vessels of the microvasculature in the papillae of intrinsic layer of the mucous membrane of the gum (hematoxylin and eosin stain, x400).

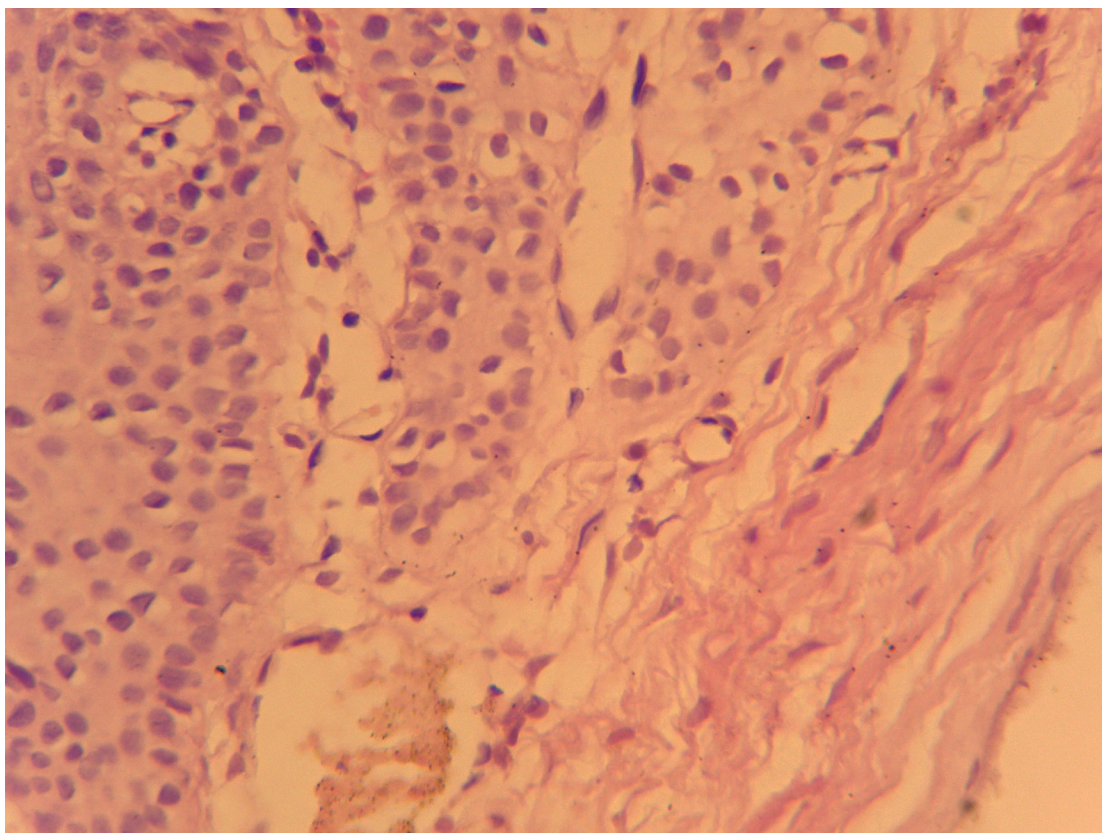


FIGURE 8. Edema of the intrinsic layer of the mucosa with the dilatation of the vessels of the microvasculature (hematoxylin and eosin stain, x400).

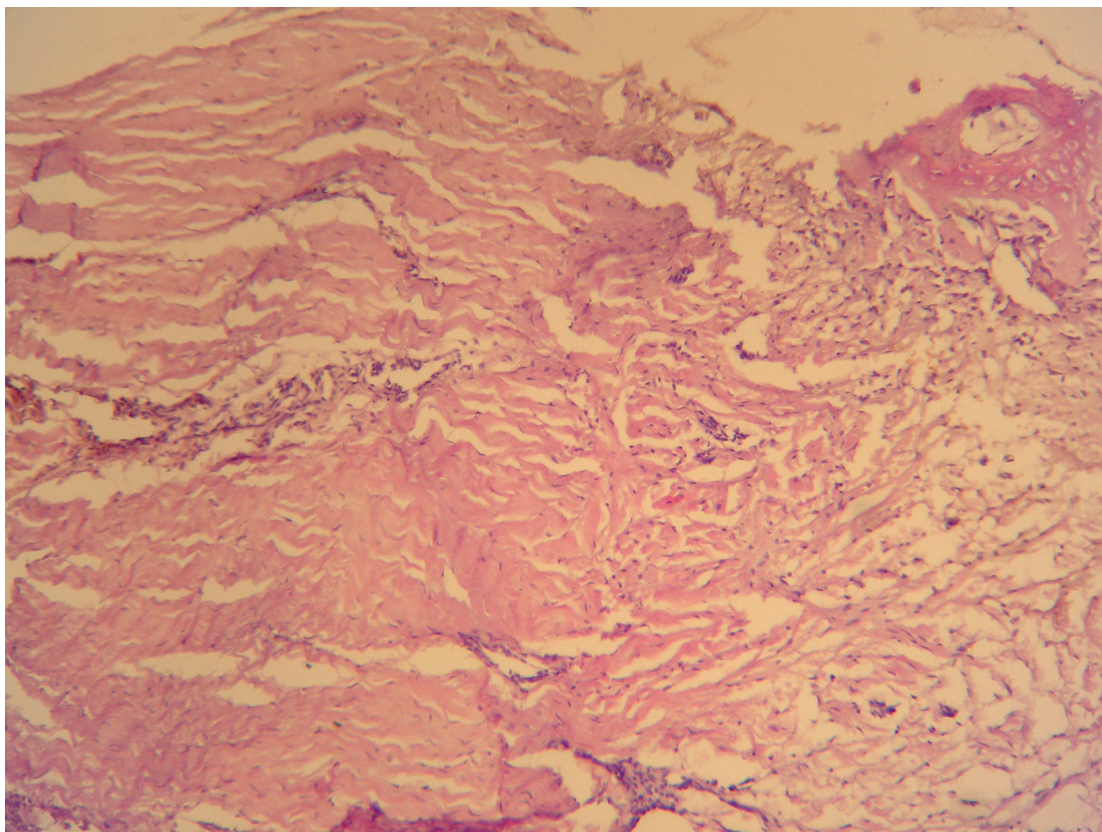


FIGURE 9. Fibrosis and focal perivascular hyalinosis of the intrinsic layer of the gingival mucosa (hematoxylin and eosin stain, x100).

day, this index in the main observation group was 0.61 ± 0.03 units (Index score is low, and oral hygiene assessment is good), in the control – 1.03 ± 0.10 conventional units (index score is average, and the assessment of oral hygiene is satisfactory). On the 21st day, this index in

the main group even more decreased and was equal to 0.41 ± 0.02 conventional units (index score is low, and oral hygiene assessment is good), in control – 0.88 ± 0.14 conventional units (index score is average, and the assessment of oral hygiene is satisfactory).

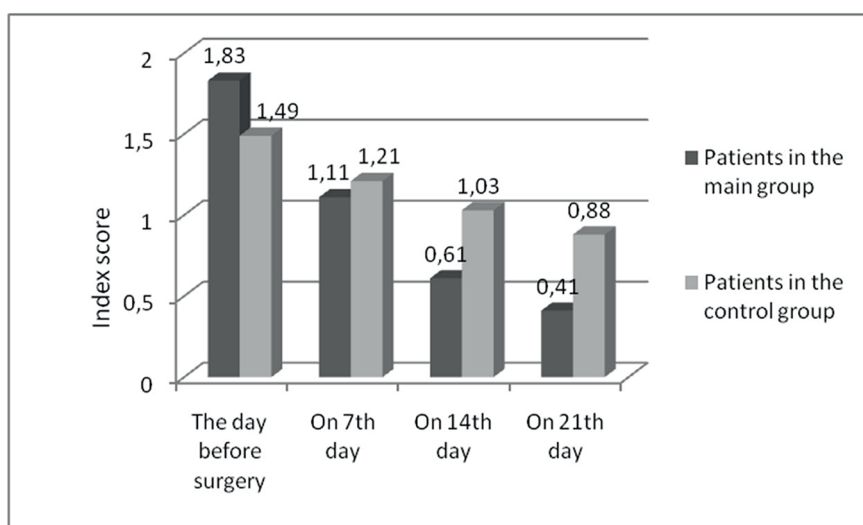


FIGURE 10. Changes in the Green-Vermillion index.

Before the operative intervention (dental implantation), i.e. on the eve of the operation (day before), the Schiller-Pisarev test (iodine number of Svrakov) scores in the cases of the main observation group were 3.5 ± 0.3 points, which indicated a moderate inflammatory process, and in the control group 3.2 ± 0.4 points (Fig 11). On the 7th day after the operation, for the patients of the main observation group, the iodine number of Svrakov was 2.0 ± 0.3 points, which indicated the presence of a poorly expressed inflammatory process,

and in the control group – 3.0 ± 0.3 points (moderately expressed inflammatory process). On the 14th day in the main observation group, the iodine number of Svrakov was 1.5 ± 0.1 points (a mild inflammatory process), in the control group – 2.8 ± 0.3 points (moderately pronounced inflammatory process). On the 21st day after the operation, in the main observation group, the iodine number of Svrakov was 1.4 ± 0.1 points (a mild inflammatory process), in the control group – 2.4 ± 0.3 points (mild inflammatory process).

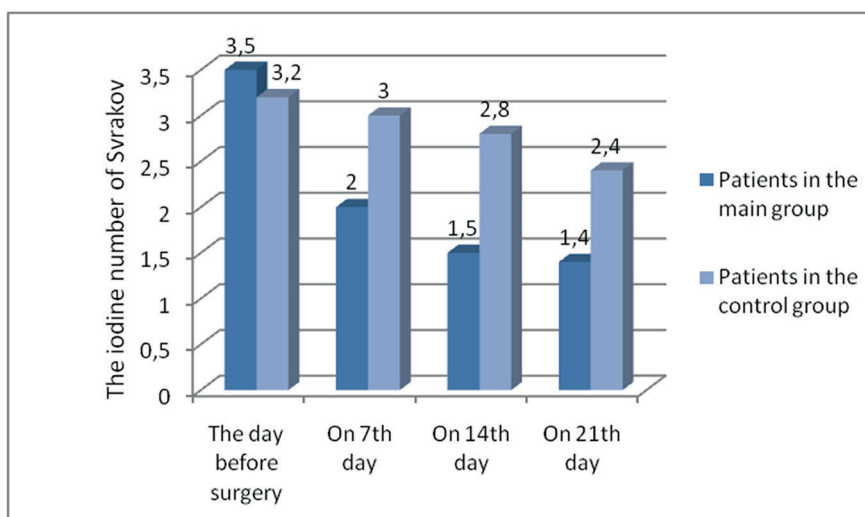


FIGURE 11. Changes in the Schiller-Pisarev test.

Before the operative intervention (dental implantation), i.e. on the eve of the operation (day before), the papillary-marginal-alveolar index (PMA) in the main group (Fig 12) was $24.0 \pm 1.1\%$, and in the control group – $22.4 \pm 1.2\%$ (estimation criterion of PMA index – mild severity of gingivitis). On the 7th day after the operation, the PMA index in the main group was

$18.3 \pm 0.8\%$, in the control group it was $21.1 \pm 1.2\%$. On the 14th day after the operation, the PMA index in the main observation group was $9.6 \pm 0.7\%$, in the control group – $19.8 \pm 1.1\%$. On the 21st day after the operation, the PMA index in the main group was $4.8 \pm 0.4\%$, in the control group – $17.3 \pm 1.3\%$ (estimation criterion of PMA index – mild severity of gingivitis).

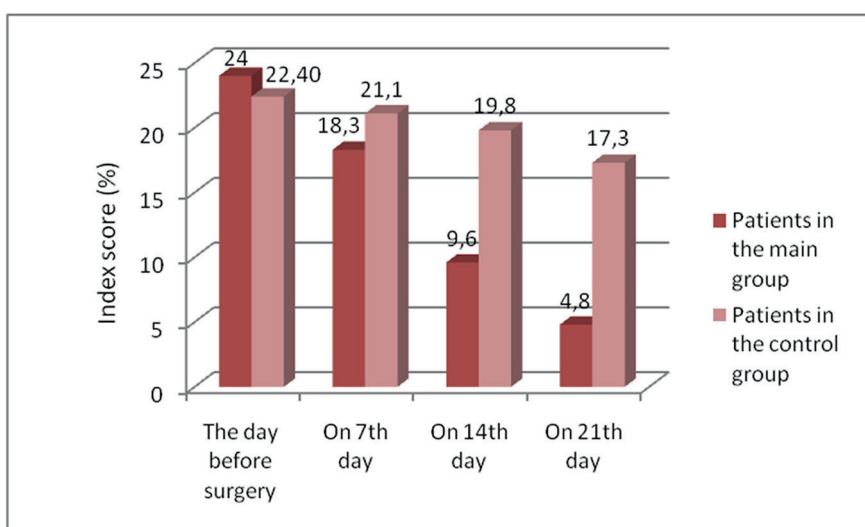


FIGURE 12. Changes in the papillary-marginal-alveolar index (PMA).

The index of gingivitis (IG) of patients of the main observation group (Fig 13) one day before the surgery was 2.2 ± 0.1 points (severe degree of gingivitis), in the control group 1.5 ± 0.2 points (average degree of gingivitis). On the 7th day after the operation, the index of gingivitis in cases of the main group was 1.5 ± 0.1 points (average degree of gingivitis), in the control group – 1.2 ± 0.2 points (average

degree of gingivitis). On the 14th day in patients, the gingivitis index in the main observation group was 0.9 ± 0.1 points (mild gingivitis), in the control group – 1.2 ± 0.2 points (average degree of gingivitis). On the 21st day after the operation, in the main group, the index of gingivitis was 0.4 ± 0.1 points (mild gingivitis), in the control group – 1.1 ± 0.1 points (average degree of gingivitis).

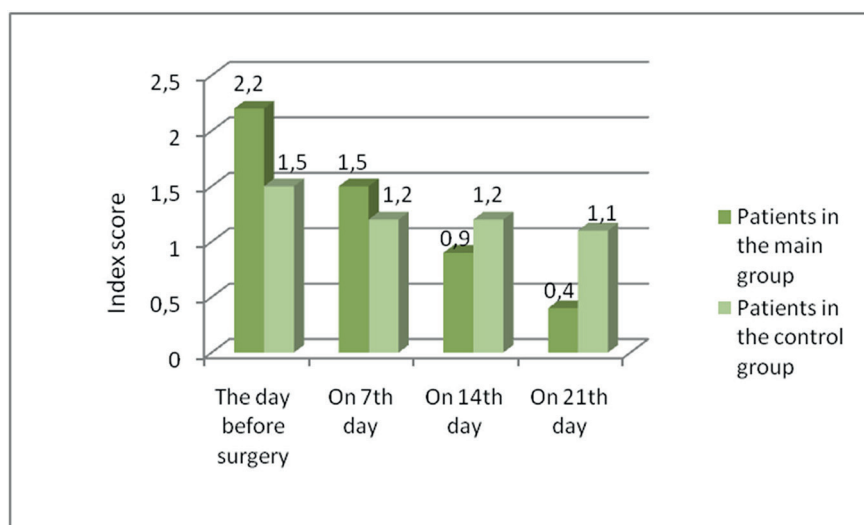


FIGURE 13. Changes in the index of gingivitis (IG).

The index of dental plaque (PI-Plax Index) for patients of the main observation group one day before the surgery was 1.6 ± 0.1 , in the control group – 1.2 ± 0.1 (Fig 14). On the 7th day after the operation, the index of plaque of the patients of the main group was 1.0 ± 0.1 , in the control group – $1.0 \pm$

0.1 . On the 14th day the index of dental plaque in the main observation group was 0.7 ± 0.1 , and in the control group – 1.0 ± 0.1 . On the 21st day after the operation, the index of dental plaque in cases of the main group was 0.4 ± 0.1 points, and in the control group – 0.9 ± 0.1 points, i.e. 2 times higher.

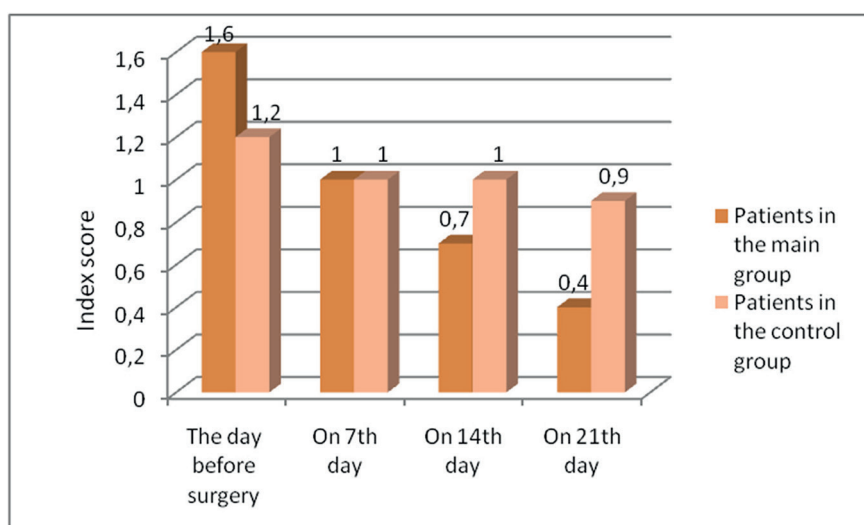


FIGURE 14. Changes in the index of dental plaque (PI-Plax Index).

The Green-Vermillion index, the Schiller-Pisarev test, the papillary-marginal alveolar index, the index of gingivitis and dental plaque of the patients of the main group (after hygienic care of the oral cavity with use of the Pierre Fabre Oral Kea laboratory production) was significantly lower than in the control group ($p < 0.001$).

Early complications in the postoperative period in the main observation group, we observed only in 3 cases (9.1%) – a partial divergence of the sutures. In the control group, early postoperative complications were observed in 8 cases (25.0%). Complications in the control group were the following: mucositis (inflammation of the mucous membrane in the area of the transgingival part of the implant without lysis of bone tissue) – in 3 cases (9.4%); partial divergence of sutures on the postoperative wound – in 4 cases (12.5%); Inflammatory infiltration of maxillary soft tissues and periimplantitis – in 1 case (3.1%) [26-28].

Patients of the main observation group used oral hygiene products of the Pierre Fabre Oral Care laboratory not only in the early postoperative period, but also after the installation of dentures. Patients were examined dynamically during observation.

The values of potentiometric measurements in cases of primary observation group are presented in Table 1.

Healthy people (27 persons) potentiometric parameters were as follows: potential difference – 32.6 ± 2.9 mV; Current intensity – 2.9 ± 0.2 μ A; The electrical

conductivity of the oral fluid is 2.7 ± 0.2 μ S.

Analyzing the potentiometric parameters that we obtained between metallic inclusions (M-M) from the main observation group patients (33 people), we established the following (Table 1): potential difference was 38.8 ± 2.7 mV ($p > 0.05$); current strength – 3.5 ± 0.3 μ A ($p > 0.05$); electrical conductivity of the oral fluid – 3.0 ± 0.3 μ S ($p > 0.05$). The potentiometric parameters obtained between metallic inclusions and mucous membrane of the alveolar bone (M-ABM) in the main observation group (33 people) were as follows (Table 1): the potential difference was 40.6 ± 3.1 mV ($p > 0.05$); current strength – 3.7 ± 0.3 μ A ($p > 0.05$); electrical conductivity of the oral fluid – 3.4 ± 0.3 μ S ($p > 0.05$). The potentiometric parameters between the dental implants and the mucosa of the alveolar bone (DI-ABM) in the surveyed primary observation group (33 patients) were as follows (Table 1): the potential difference was 37.3 ± 2.4 mV ($p > 0.05$); current strength - 3.4 ± 0.2 μ A ($p > 0.05$); electrical conductivity of the oral fluid – 3.1 ± 0.2 μ S ($p > 0.05$).

The potentiometric parameters between the dental implants and the non-removable denture metal (DI-M) in the surveyed primary observation group (33 people) were as follows (Table 1): potential difference was 37.0 ± 2.1 mV ($p > 0.05$); current strength – 3.4 ± 0.2 μ A ($p > 0.05$); electrical conductivity of the oral fluid – 2.9 ± 0.2 μ S ($p > 0.05$).

TABLE 1. Potentiometric values of the main observation group patients.

Observation Group		Number of Patients	Potentiometric Values		
			Potential Difference (mV)	Current Strength (μ A)	Electrical Conductivity of the Oral Fluid (μ S)
Main observation group	Between metallic inclusions (M-M)	33	38.8 ± 2.7 $p > 0.05$	3.5 ± 0.3 $p > 0.05$	3.0 ± 0.3 $p > 0.05$
	Between metallic inclusions and alveolar bone mucosa (M-ABM)	33	40.6 ± 3.1 $P > 0.05$	3.7 ± 0.3 $p > 0.05$	3.4 ± 0.3 $p > 0.05$
	Between dental implants and alveolar bone mucosa (DI-ABM)	33	37.3 ± 2.4 $p > 0.05$	3.4 ± 0.2 $p > 0.05$	3.1 ± 0.2 $p > 0.05$
	Between dental implants and non-removable denture metal (DI-M)	33	37.0 ± 2.1 $p > 0.05$	3.4 ± 0.2 $p > 0.05$	2.9 ± 0.2 $p > 0.05$
Control group (healthy people)		27	32.6 ± 2.9	2.9 ± 0.2	2.7 ± 0.2

p – reliability of differences in comparison with healthy people.

All the potentiometric parameters obtained by us in the primary observation group (with periodontal disease) did not differ significantly from the norm (healthy people) and the control group of patients (without periodontal disease).

On the control orthopantomograms made both in the early and late periods after the dental implantation, in the cases of the main group (with periodontal disease) we observed no bone changes.

Conclusion

Based on the data obtained, it can be concluded that complex oral hygiene care by production of the Pierre Fabre Oral Care laboratory is the most effective, in comparison with traditional means of hygienic care, in cases with periodontal disease after dental implantation. Using the products of the laboratory Pierre Fabre Oral Care (Eludril, Elugel, Parodium, and Elgidium) it is proved that they have a significant antibacterial, anti-inflammatory, analgesic and antagonistic effect. The use of oral hygiene products by Pierre Fabre Oral Care made it possible to reduce the number of early postoperative inflammatory complications by 3 times and prevent the development of late postimplantation complications.

The Pierre Fabre Oral Care oral hygiene products are recommended for patients after dental implantation to prevent early and late inflammatory complications [29].

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None.

Conflict of Interests

None.

Role of Authors

Oleksandr O. Tymofieiev (concept of the paper, material collection, and editing)

Mariia O. Yarifa (material collection and writing)

Ethical Approval

Approval was obtained from the Medical Ethics Committee of the Shupyk National Medical Academy of Postgraduate Education, Kyiv, Ukraine.

Patient Consent

No needed.

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None.

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