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DENTAL IMPLANTS EXPOSURE PREVENTION IN THEIR OSSEOINTEGRATION PERIOD

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ABSTRACT

Aim of the study: Assessing the efficacy of the dental implants exposure prevention method during their osseointegration period. Material and methods. 491 implants were conventionally installed in 214 patients, study group – 237, control group – 254. An ointment „Levomekol" was introduced into the intra-implantation space at the implants of the study group, before the cover screw threading. An active part of the ointment has an effect against aerobe and anaerobe bacteria – „Chloramphenicol". Results: In the study group, the frequency of implant exposure during the osseointegration period, as well as the degree of marginal periimplant bone resorption, significantly decreased. Conclusions: The cause of implant exposure during osseointegration is the inflammatory process that develops as a result of microbial contamination of the intra-implantation space at the first surgical step. The application of antimicrobial preparations inside the implants contributes to an essential decrease in the frequency of their exposure and to the reduction of periimplant marginal bone loss.

Key words: dental implant, spontaneous exposure of implants, bacterial colonization of the implants.

INTRODUCTION

Installing implants in two surgery sessions *ad modum Branemark* in day-to-day dental implantology is widespread nowadays [1]. By placing the subgingival implants, the postoperative wound is isolated from the septic medium of the oral cavity, and the implants are protected from the action of the masticatory forces during the osseointegration period. This creates favorable conditions for implants osseointegration. However, despite the fact that the postoperative wound of the mucosa is cured *per primam*, furthermore during the osseointegration in the tissues adjacent to some implants there are acute inflammatory processes with their subsequent chronication, platform exposure and periimplant bone loss [2] [3] [4]. To explain this phenomenon at the end of the last century, it was suggested that the dehiscence of the over-implantation mucosa is the result of the inflammatory process initiated by the microflora entering the implant at the first surgical step, but convincing evidence has not been presented up to now [5] [6]. This situation has contributed to the use of terms with unidentified meaning - *„spontaneous exposure of implant platforms"*, *"premature exposure"*, which are used nowadays in everyday practice [2] [4] [7] [8].

The microbial contamination of the internal space of the implants during their installation (prior to the cover screws application) was observed at 81.7% implants [9]. It has been assumed that its microflora and toxins through the "cover screw-corp implant" spreads into adjacent tissues causing inflammatory-destructive processes with the exposure of the implant platform and its consequences.

Further studies are required in order to confirm or counteract the role of the infection got into the intra-implantation at the implant exposure during the osseointegration period. The present study is dedicated to that question.

Working assumption: the application of an antimicrobial substance and the stimulation effect of the tissue regeneration inside the implants will reduce the probability of developing the

inflammatory process, implant exposure and respectively reduce periimplant bone loss.

Purpose: Elaboration of a dental implants exposure prevention method during their osseointegration period.

MATERIAL AND METHODS

Criteria for the **inclusion in the study**: patients with various forms of edentation, good oral cavity sanitation, without contraindications for implantation, where it was possible to install them in a conventional way. Only patients whose the postoperative wound was healed *per primam intentionem* were included in the study.

After being acquainted with the essence of the research and its harmlessness, 491 implants ("Alpha Bio", "Tag") were installed in 214 (48±2.44 years) patients as recommended by the manufacturers. 106 persons with 237 implants (2.23 *per patient*) were included in the study group, control group - 108 people with 254 implants (2.35 *per patient*) were included in the control group. On the day of the intervention 1 hour before implant placement and subsequently for 5-7 days, a wide-spectrum antibiotic was administered to patients *per os.* Before the operation, for 2-3 minutes, the oral cavity was treated by staining and baths with 0.2% chlorhexidine bigluconate solution.

The following were performed: anesthesia by infiltration with 2% Articaine solution, incision on the center of the alveolar crest, exposure of the alveolar crest by elevating the mucoperiosteal flap, with external irigation the neoalveolus was created, implants were positioned with the platform at cortical level. Prior to the application of the cover screw and the sutures, the wound was irrigated with physiological serum. In the additional study group was applied *"Levomekol"* inside the implants by the syringe – an ointment recommended for the treatment of superinfected wounds. This remedy contains *"Chloramphenicolum"* (an antibiotic with the effect against aerobic and anaerobic bacteria) and „*Dioximetiltetrahidropirimidinum*" - a preparation that stimulates the regeneration processes. After 7-9 days the sutures were suppressed, the recovery of the over-implant mucosa was appreciated. Patients have been repeatedly acquainted with the complications symptoms that may occur during osseointegration of implants and the actions that need to be taken in each specific case. Monthly control visits were recommended, and in cases of dolor, swelling or other inconveniences – obligatory emergency addressing.

Preoperatively, in suture suppression, at control visits and at the second surgical step, the integrity of the over-implant gum and adjacent soft tissues were studied visually and by analyzing the photo image on the computer in extended mode. The Tal H. classification was used to assess the degree of implant exposure [10]. Cases of I and II grades of exposure (after Tal H.) were included in the *"fistula"* group, those with grade III and IV (partial or total exposure of the cover screw) in the *"dehiscence"* group.

In order to highlight the osseoregenerative stimulation effect of the „*Dioximetiltetrahidropirimidinum*" (component of the *"Levomekol"* ointment) informative OPGs were selected, on which it was possible to evaluate the periimplant bone changes in 91 (38.4%; 95%CI [32.2-44.6]) implants in the study group and 102 (40.2%; 95%CI [34.1-46.2]) - in the control group. The evolution of periimplant crestal bone (apposition, resorption) was studied by comparing the radiographic data immediately after implantation with those found at the second surgical step. On OPG, using Adobe Photoshop, the equivalent of 1 *mm* in *pixels* was appreciated. The changes of the periimplant crestal bone were appreciated with the use of these indicators in each specific case [11].

RESULTS

The data obtained (Table 1) showed that at the end of the osseointegration period, in the study

group the implant exposure was detected at 14 (13.2%; 95%CI [6.8-19.7]) patients, of which in the form of fistula – at 12 (11.3%; 95%CI [5.3-17.4]), and in the form of dehiscence – at 2 (1.9%; 95%CI [-0.7-4.5]). In the *control* group the exposure was found at 46 (42.6%; 95%CI [33.3-51.9]) *patients*, from which at 34 (31.5%; 95%CI [22.7-40.2]) – in the form of a *fistula* and at 12 (11.1%; 95%CI [5.2-17.0]) – in the form of a *dehiscence*.

When evaluating the frequency of exposure for the number of implants, it was found that in the study group out of the total number of 237 implants exposures were found in the 23 (9.7% 95%CI [5.9-13.5]) implants, 18 of them (7.6%; 95%CI [4.2-11.0]) – in the form of a fistula, and 5 (2.1%; 95%CI [0.3-3.9]) – in the form of a dehiscence. In the control group out of the total number of 254 implants exposures were wound at 81 (31.9%; 95%CI [26.2-37.6]), of which in the form of a fistula – 58 (22.8%; 95%CI [17.7-28.0]), in the form of a dehiscence – 23 (9.1%; 95%CI [5.5-12.6]).

Thus, the analysis of the obtained data demonstrates that when the implants were installed in two surgical steps with the application of the *Levomekol* ointment in the intra-implantation space (study group), the frequency of the implant platform exposure during the significant osseointegration period decreased by a factor of 3.28 ($p < 0.001$).

Table 1. The implants exposure ratio at the end of the osseointegration period depending on the used method.

Symptom	Group - study				Group - control			
	Patients 106		Implants 237		Patients 108		Implants 254	
	pat	%	imp	%	pat	%	imp	%
Fistula	12	11.3	18	7.6	34	31.5	58	22.8
Dehiscence	2	1.9	5	2.1	12	11.1	23	9.1
Total	14	13.2	23	9.7	46	42.6	81	31.9

The data allows us to conclude that *chloramphenicol*, a preparation with antibacterial effect, suppresses the development of microflora within the implants, preventing the inflammatory-destructive process in periimplant tissues. This reduces the frequency of implant exposure cases and respectively the periimplant marginal bone resorption rate.

Considering that a component of the *Levomekol* ointment is the *Dioximetiltetrahidropirimidinum* preparation, which among the many beneficial actions has the property to stimulate the tissues regeneration, the evolution of the periimplant bone (resorption, apposition) was studied comparatively (the study group versus the control group), the markings being appreciated on OPG performed immediately after the operation and at the end of the osseointegration period.

Analysis of the results obtained (Table 2) showed that the periimplant bone apposition values were similar in both groups which allowed us to conclude that the *Dioximetiltetrhidropirimidinum* preparation (component of the *Levomekol* ointment) introduced into the intra-implantation space did not show stimulation properties of bone regeneration.

At the same time, marginal periimplant bone resorption values were significantly lower ($p<0.001$– mesial and $p<0.01$ – distal) at the implants within which *Levomekol* was applied, relative to those in the control group. According to the analysis of these data, it can be stated that the cause of the implant platform exposure during the osseointegration period is the microbial contamination of the intra-implantation space at the first surgical step.

Table 2. The comparative analysis of the bone resorption and apposition at the end of the osseointegration period

Phenomena	Study group – 91 implants				Control group – 102 implants			
	Mesial		Distal		Mesial		Distal	
	N	M±ES	N	M±ES	N	M±ES	N	M±ES
Appositions	19	0.3±0.04	18	0.27±0.04	17	0.32±0.087	20	0.24±0.057
Resorptions	72	0.31±0.06	73	0.26±0.05	85	0.66±0.066	82	0.50±0.057
Resorption comparison among the groups (horizontally)	p<0.001 mesial		p<0.01 distal		p<0.001 mesial		p<0.01 distal	

DISCUSSIONS

The influence of implant exposure during the osseointegration period on the periimplant bone was studied and is still being studied. A direct correlation between the implant platform exposure and periimplant marginal bone loss is showed by the performed research [2] [4] [12]. Thus, a relationship between two phenomena - the platform exposure and the periimplant marginal bone loss was established. In this situation exposure is a *cause* and the loss of bone – *effect.* The implant exposure does not develop without cause, it occurs as a result of the effect on the over-implantation mucosa of a factor, i.e. it has a cause (reason). Therefore, to prevent/reduce marginal bone loss, it is necessary to determine the cause of implant exposure and to take measures to combat it. Attempts to highlight the cause of the over-implant mucosal dehiscence during the osseointegration period have been taken in some studies, however, they have completed with a description of the contributory factors. It has been assumed that the implant exposures occur when they are covered with a thin phenotype gum, but this hypothesis has not been confirmed [13] [14] [15]. Cassetta M. et collaborators had demonstrated that during the osseointegration period, periimplant bone loss is significantly higher in subcortically positioned implants, in the posterior sectors of the jawbones and in those installed to women [16]. In another recent study, it was found that premature exposure of the implant platform is being found more often at male patients, at platform-matched cover screws, supra-cortical placed implants, implants located in the posterior sectors of jawbones [4]. Although the same question was studied in the described studies - *the contributory factors of the implant platform exposure*, the results obtained are contradictory.

Comparing the results from the analyzed studies with those obtained by us, we mention that the implants used in our study are with the open platform and they have been installed in both groups at the cortical level. But the main difference is that the *"Levomekol"* remedy, within the composition of which there is a preparation *"Chloramphenicol"* (an antibiotic with the effect against aerobic and anaerobic bacteria) was applied inside the implants of the study group. The analysis of the obtained results showed that during the osseointegration period, the frequency of the platform exposure in the study group is significantly ($p<0.001$) lower – 9.7% implants versus 31.9% in the control group.

CONCLUSIONS

Within the obtained data, we consider that the cause of subgingival implants exposure during the osseointegration period is the inflammatory process that develops as a result of the microbial contamination of the intra-implantation space at the first surgical step. The application of antimicrobial preparations inside the implants contributes to an essential decrease in the frequency of their exposure as well as to the reduction of periimplant marginal bone loss.

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