(RESEARCH ARTICLE)

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Comparison effect of two prophylactic protocols on prevention, complications biological and bone resorption

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Abstract

Objective: Compare effect of two prophylactic protocols on prevention of biology complications and on bone resorption, before and three-month post-surgery of oral implants.

Method: Clinical, observational, longitudinal study. Approved by the Institutional Ethics Committee. The sample 29 patients signed the informed consent to participate in this study were distributed into two groups: Group 1: with oral mucosa smears culture and antibiogram to select effective prophylaxis antimicrobial and therapy. Urinary levels deoxypyridinoline (DPD). Bone height measured before and three months after oral implant surgery. Group 2: Amoxicillin prophylaxis, bone heights before and three months after oral implant surgery. The two groups underwent clinical examination 8 and 30 days after surgery to assess early complications.

Results: The average age for both sexes in both groups; (women 53.53 year; men 54.58 year). Group 1: 17 patients: 6 male patients (35.3%) and 11 female patients (65.7%). Bacterium identified: Streptococcus anginosus (8 patients), Porphyromonas gingivalis (5 patients) and Prevotella intermedia (4 patients). Antibiotics prescribed according to degree of sensitivity: Amoxicillin, Clindamycin, and Cephalexin and Cephadroxyl 30 minutes before surgery. Urinary DPD Female 8.82 nM DPD/mM, and male 5.53 nM DPD/mM .The prevalence of infection related complications during 30 days after surgery was 0%.Group 2:6 male patients and 6 female patients Prophylaxis Amoxicillin (2 g) 30 minutes before surgery. Bone height reabsorption during the three months of observation was 1.693 mm (p >0.05). The prevalence of infection related complications during 30 days after surgery was 50%. The difference between groups for frequency of complications was significant (p = 0.0003). Bone height difference between groups was not significant.

Conclusion: The use of antibiotic prophylactic protocol based on the oral mucosa smears and antibiogram to select effective antimicrobial, prevents the presence of early biology complications and reduces bone resorption.

Keywords: Antibiogram; Antibiotic prophylaxis; Infections; Bone resorption

1. Introduction

The use of dental implants to restore edentulous sites is recognized as a safe and successful modality of treatment. However longitudinal studies recognize the presence of early and late complications (1-5). Early complications are those presented during the first month post-surgery, before the establishment of an intimate bone/implant contact,

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named osseointegration. Various external factors such as bacterial contamination or systemic conditions like osteopenia induce infection, inflammation, bleeding and other complications reducing Osseo integration and producing implant failure (6-9).

Therefore, prevention and early detection of complications is a relevant clinical aim (10-12). The clinical, radiographic and biochemical diagnostic parameters are of great help for that purpose. The prescription of prophylactic antibiotics is accepted to prevent infections during the surgical intervention and frequently is performed by a single-dose administered 30 minutes or one hour before the surgical procedure, depending on the pharmacokinetic parameters of the antibiotic selected, to maintain high plasma concentrations during the time of surgery. A second dose is given when the surgery time is prolonged, according to the kind of surgery and patient´s age (13-15).

Clinical studies had provided evidence that the prevalence of post-surgery complications is lower in patients receiving the right antimicrobial prophylaxis that depends on the antibiotic selection according to sensitivity of the identified bacterial species. The individual antibiotic selection avoids the development of bacterial resistance, a world-wide concern, and is more effective to fight oral bacteria colonizing medical devices such as oral implants (16).

Another factor in the process of Osseo integration is the mechanism of bone turnover. Bone is a dynamic tissue presenting continuous remodeling; when resorption is increased the presence of osteopenia is indicated by an increment in the levels of deoxypyridinolines (DPD) measured in urine.-M nM mM of creatinine (17, 18). DPD is a biochemical marker because it is a cross-link product of collagen molecules, released in urine. Normal DPD reference values are: 3-5.4 nM/ mM of creatinine for men and 37.4 nM/ mM in women. High DPD values are early indicators of bone resorption reported high levels of DPD in menopausic women (average: 9.594 nM/mM, eight days before surgery, in women with initial bone height of 1,41 mm and 1,16 mm, three months after surgery. This level of bone resorption is almost equal to the internationally accepted normal value: 1 mm/year (19).

In oral implant surgery literature there are few studies comparing preventive protocols to avoid surgical infection and simultaneously measuring osteopenia biomarkers related to bone turnove found high correlation (r=1) between urinary DPD levels and bone height changes after dental implant surgery in menopausic women (20). This kind of studies indicate that in order to prevent complications after dental implant surgery it is important to evaluate bone health state and to identify the species of bacteria present in mouth and their sensitivity to different antibiotics. Therefore, the objective of the present study was to compare the effect of two prophylactic protocols on the prevention of biology complications and on bone resorption pre- and three-month post-surgery of oral implants.

2. Methods

Clinical, observational, longitudinal study. This clinical assay was approved by the Institutional Ethics Committee and developed according to the principles of Helsinki Declaration. The sample of 29 patients signed the informed consent to participate in this study and were distributed into two group. All the patients were clinically evaluated 8 and 30 days after surgery to detect any early complication (pain, edema, redness, hyperthermia, suture dehiscence); and both groups, crestal-apical bone height in the surgical site was measured before surgery and three months after it, using the Galileos® software.

Group 1: 8 days before surgery the patients provided a sample of oral mucous smear for bacterial culture to identify bacterial species and to practice antibiogram to select the proper antibiotic. Urine was collected two hours after the first elimination of urine to measure DPD levels by solid phase enzyme immunoassay (IMMULITE 2000 Pyrilinks-D, Siemens, USA).

Group 2: Prophylaxis following the current institutional protocol, receiving oral Amoxicillin 2 g, one hour before surgery. DPD values, culture and antibiogram not practiced.

The descriptive statistics included calculation of average and standard deviation of bone heights and age and percentages of prevalence. The boner height results were compared using t test and the frequency of complications was compared by Chi-square test, at a level of significance p = 0.05. Mini-tabs were used to accomplish the statistical analysis.

3. Results

The average ± standard deviation age was similar for both sex groups: women 53,53 ± 8,98 and men: 54,58± 6,57 years.

Group 1: included 6 male patients (35.3%) and 11 female patients (65.7%); Bacteria present in oral mucous: Streptococcus anginosus in 8 patients (47%), Porphyromonas gingival is in 5 patients (29%), Prevotella intermedia in 4 patients (24%). Antibiotics prescribed for prophylaxis according to sensitivity to prescribe 30 minutes before surgery: Amoxicillin 2 gr (8 patients, 47%), Clindamycin 1g (4 patients, 24%), Cephalexin 2 gr (4 patients, 24%) and Cephadroxyl 1 gr (1 patient; 5 %). Bone reabsorption during the three months of observation was 0.88 mm (p >0.05) (Table1). Urinary DPD values; female 8.82 nM DPD/mM, (Normal: 3.0 – 7.4 nM DPD/mM) and male 5.53 nM DPD/mM (Normal: 2.3 – 5.4 nM DPD/mM). The prevalence of infection related complications during 30 days after surgery was 0% (Table 2)

Group 2: 6 male patients and 6 female patients. Prophylaxis with Amoxicillin (2 g) 30 minutes before surgery. Bone height reabsorption during the three months of observation was 1.693 mm (p >0.05) (Table1). The prevalence of infection related complications during 30 days after surgery was 50% (Table 2).

Table 1 Bone height at the implant site before and 3 months after surgery

Variable	Group	n	Average mm	S.D.	Minimum	Maximum
Basal bone height	1	16	12.149	2.168	9.890	17.350
	2	12	12.218	2.118	10.200	17.350
3 months Post-surgery bone height	1	14	11.269	2.261	8.980	16.460
	2	12	10.525	2.454	7.000	16.380
Difference in 3 months	1		0.88			
	2		1.693			

Table 2 Early complications presented in each group.

Complication	Group 1 Antibiogram	Group 2 No antibiogram
None	17	6
Pain	0	4
Suture dehiscence oedema	0	2
	0	6

The distribution of bone height data in both groups was normal. Therefore, the Student t test was applied to compare groups. For basal values p value was p = 0,934 and 3 months post-surgery p = 0,433. The Chi2 contingency test for association of prevalence of complications to kind of prophylactic protocol was significant (p = 0.0003).

4. Discussion

In the present research the age in both groups and sex categories was over 53 year which is usual for dental implant patients (21, 22). The literature reports that for people older than 40 year the collagen synthesis is reduced and the process of bone resorption is accelerated (17 -19) was confirmed in the group receiving the experimental protocol by DPD levels higher than normal (6,68 nM DPD/mM Creatinine).

Compared to other studies (18, 19) the bone resorption during the first three months was rather low (0,88mm) and inferior to the average in the control group receiving amoxicillin (1,69 mm). Normal levels expected for bone resorption are 1 mm/year (19).

The lower bone resorption in the group treated with antibiogram oriented prophylaxis can be explained by the absence of early complications during three months. In the amoxicillin treated group, 50% of the patients presented infection related complications and a significant increment in the frequency of early complications (p = 0.0003).

The risk of complications should be evaluated as part of the dental implant protocols of treatment, as suggested by in the present study the levels of DPD were measured only in the group of patients treated with this new prophylaxis protocol.

More clinical studies with this prophylaxis protocol and longer periods of follow up are necessary before a definitive recommendation.

5. Conclusion

The use of antibiotic prophylactic protocol based on the oral mucosa smears and antibiogram to select effective antimicrobial, prevents the presence of early biology complications and reduces bone resorption.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflict of interest. The investigators assumed the expenses of additional tests demanded by the research.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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