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Peri-implant Status in Relation to Microbiological Aspects and Selected Biomarkers with the Impact of *Aloe vera* gel among a Group of Patients with Dental Implants

(Observational and Clinical Study)

A Thesis

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Abstract

Background: The health of peri-implant tissues is one of the most important aspects for the long-term success of dental implants. The structural differences between implants and natural teeth, making the implant more vulnerable to bacterial plaque which is the main etiological factor in peri-implant diseases. Thus, more care required for proper monitoring and maintenance of soft tissue health around implants. The control of bacterial plaque by using an effective preventive regimen and therapeutic agents, in conjunction with early diagnosis of inflammatory conditions through analysis of peri-implant sulcular fluid have vital importance in prevention of any irreversible pathological conditions of peri-implant tissues.

Aims of the study: To investigate peri-implant health status and to evaluate and compare clinical and microbiological aspects as well as selected immunological and biochemical biomarkers in sulcular fluid around implants and contralateral natural teeth in the same patients with the impact of *Aloe vera* gel.

Materials and methods: The observational study included 150 dental implants installed in 43 patients receiving implant supporting prosthesis, their age ranged from 20-69 year. Peri-implant status was assessed by clinical parameters including: gingival index, plaque index, calculus index, mobility index, marginal tissue recession and presence or absence of pain and exudate. From those subjects 20 females aged 25-45 year who exhibited the presence of one clinically stable implant carrying a full ceramic crown and one contralateral natural tooth were selected to be enrolled in a split-mouth study. All participants were apparently healthy with no history of any systematic diseases and they have been treated with a two-piece implant system which should be in function for at least 6 months. Clinical parameters involving plaque index, gingival index, probing pocket depth

and bleeding on probing were measured for both implants and teeth. Sulcular fluid around implants and teeth was collected for analysis of selected biomarkers levels including: interleukin-1β, myeloperoxidase, alkaline phosphatase, lactate dehydrogenase and calcium ion. In addition, samples of subgingival plaque were collected from implants and teeth for microbial analyses of Gram-positive bacteria, Gram-negative bacteria and Candida species. Clinical parameters measurement, biomarkers and microbial analyses were obtained at base line and 2 weeks after the application of *Aloe vera* gel.

Results: In the observational study, clinical parameters for dental implants revealed that gingival index was (1.31 ± 0.47) and 96% of dental implants have marginal mucosal inflammation while plaque index was (1.56 ± 0.49) and calculus index was (0.30 ± 0.41). Dental implants exhibited 20% marginal mucosal recession, 3.3% mobility, 0.7% exudate and 2.6% presence of pain. Moreover, the success and survival rates of implants were 70% and 26.6%, respectively, while the failure rate was 3.3%. Concerning split-mouth study, comparison of clinical parameters showed no statistically significant difference for both plaque index and bleeding on probing values between implants and teeth. On the other hand, gingival index and probing pocket depth were higher in implants than in teeth with statistically significant difference for gingival index and highly significant difference for probing pocket depth. Microbial analysis revealed no statistically significant difference in the counts of microorganisms between the two groups, although they were lower in implant than that in teeth. Finding also showed no significant differences in the levels of interleukin-1β and alkaline phosphatase, between the two groups, while myeloperoxidase and lactate dehydrogenase levels were higher in implants than natural teeth with statistically highly significant difference. Conversely, calcium ion level was significantly higher in teeth than in implants. Regarding the effect of *Aloe vera* on microorganisms, there was a highly

significant reduction in the count of Gram-positive bacteria and Candida species after application of *Aloe vera* gel for both implants and teeth. On the other hand, the count of Gram-negative bacteria appears not to be affected by *Aloe vera* gel.

Conclusions: High marginal mucosal inflammation around dental implants necessitates a systematic hygienic practice. No differences were found in microbiological analysis of subgingival plaque from dental implants and teeth. On the other hand, the differences in clinical, inflammatory and biochemical features between the tissue around dental implants and natural teeth make the health and maintenance of soft tissue around implants of critical importance for long-term survival of implants. Moreover, *Aloe vera* is a promising herb with anti-microbial and anti-inflammatory effects that could be used as a beneficial agent in treatment and prevention of peri-implant diseases.