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Assessment of salivary titanium levels among patients undergoing dental implants: A case control study

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***Abstract*---**Background: Dentistry is a continually evolving branch of medicine that is significantly affected by technological developments. The goal of modern implant dentistry is to restore physiological function, comfort, aesthetics, speech, and health to individuals who have missing teeth. The present study was conducted for assessing the salivary titanium levels among patients undergoing dental implants. Materials & methods: A total of 30 patients who underwent dental implant therapy were enrolled in the present study. Complete clinical and demographic details of all the patients were obtained.

Another set of 30 healthy subjects were enrolled as control group. All the patients underwent dental implant procedures under the hands skilled and experienced implantologists. Postoperatively after one month, salivary samples were obtained from all the patients of the dental implant group and salivary titanium levels were evaluated. Salivary samples were also obtained from the control group subjects and salivary titanium levels were evaluated and compared. Results: The mean concentration of salivary Titanium among subjects of dental implant group and control group was 158.2 µg/L and 239.8 µg/L respectively. Significant results were obtained while comparing the salivary titanium levels among the subjects of the study group and control group. Conclusion: Salivary titanium levels show significant alteration among patients undergoing dental implant therapy.

***Keywords*---**dental, implants, titanium.

Introduction

Dentistry is a continually evolving branch of medicine that is significantly affected by technological developments. The goal of modern implant dentistry is to restore physiological function, comfort, aesthetics, speech, and health to individuals who have missing teeth. Tooth loss is mostly caused by decay, by failed root canal treatment, by inflammatory loss of periodontal tissue, or by fracture. In the past, single tooth loss was usually treated with a three-unit fixed partial denture, filling the gap with a pontic which was supported on both sides by the abutment teeth. This treatment, also known as a fixed bridge, is not necessarily the optimal solution, as it requires crown preparation of the abutment teeth. As a result, these teeth are more susceptible to decay and gum disease, which can lead to further tooth loss or denture failure.[1- 3]

Unsightly gaps between teeth can be filled by dental implants without causing additional damage to other teeth. Furthermore, endosseous implants can prevent the loss of alveolar bone. The alveolar processes, within the mandible and maxilla, surround and support the teeth to ensure their function. In contrast, chewing, biting, and speaking lead to micromovements of the tooth radix within its socket (periodontium), indirectly causing the rebuilding and remodeling of alveolar bone. When a tooth is lost, the lack of bone stimulation leads to decreased alveolar volume. As more teeth are lost, more areas of bone cannot be maintained. An endosseous implant can prevent further bone loss but should be integrated into alveolar bone as soon as possible after extraction in order to prompt bone stimulation.[4- 6] Hence; the present study was conducted for assessing the salivary titanium levels among patients undergoing dental implants.

Materials and Methods

The present study was conducted for assessing the salivary titanium levels among patients undergoing dental implants. A total of 30 patients who underwent dental implant therapy were enrolled in the present study. Complete clinical and demographic details of all the patients were obtained. Another set of 30 healthy

subjects were enrolled as control group. All the patients underwent dental implant procedures under the hands skilled and experienced implantologists. Postoperatively after one month, salivary samples were obtained from all the patients of the dental implant group and salivary titanium levels were evaluated. Salivary samples were also obtained from the control group subjects and salivary titanium levels were evaluated. Comparative evaluation of salivary titanium levels was done among both the study groups. SPSS software was used for evaluation of results.

Results

Mean age of the patients of the study group and control group was 39.5 years and 41.7 years respectively. Majority of proportion of subjects of the both the groups were males. The mean concentration of salivary Titanium among subjects of dental implant group and control group was 158.2 µg/L and 239.8 µg/L respectively. Significant results were obtained while comparing the salivary titanium levels among the subjects of the study group and control group.

Discussion

Dental implant treatment has been one of the most recent success stories of dentistry. The use of dental implants in the treatment of complete and partial edentulisms has become an integral treatment modality in dentistry. Dental implants are made of biocompatible materials and they are surgically inserted into the jaw bone primarily as a prosthetic foundation. Titanium and titanium alloys are commonly used as dental implant materials. The process of integration of titanium with bone has been termed as "osseointegration" by Branemark.[5- 7] Presently, most of the commercially available implant systems are made of pure titanium (CP-Ti) or titanium alloy Ti-6Al-4V. Titanium and its alloys provide strength, rigidity, and ductility similar to those of other dental alloys. Whereas, pure titanium castings have mechanical properties similar to Type III and Type IV gold alloys, some titanium alloy castings, such as Ti-6Al-4V and Ti-15V have properties closer to Ni-Cr and Co-Cr castings with the exception of lower modulus. Titanium and its alloys give greater resistance to corrosion in saline and acidic environments. Even though titanium alloys were exceptionally corrosion-resistant because of the stability of the TiO 2 oxide layer, they are not inert to corrosive attack. When the stable oxide layer is broken down or removed and is unable to reform on parts of the surface, titanium can be as corrosive as many other base metals.[7- 10] Hence; the present study was conducted for assessing the salivary titanium levels among patients undergoing dental implants.

Mean age of the patients of the study group and control group was 39.5 years and 41.7 years respectively. Majority of proportion of subjects of the both the groups were males. The mean concentration of salivary Titanium among subjects of dental implant group and control group was 158.2 µg/L and 239.8 µg/L respectively. Papi P et al in a previous study tested the hypothesis that there would be no differences in salivary concentrations of titanium (Ti), vanadium (V), nickel (Ni) and arsenic (As) ions among patients with dental implants, healthy (Group A) or affected by peri-implantitis (Group B), compared to subjects without implants and/or metallic prosthetic restorations (Group C). A total of 100 patients

were enrolled in the study (42 males and 58 females), distributed in three groups: 50 patients in Group C, 26 patients in Group B and 24 patients Group B. In their study, concentrations of metallic ions were higher in Group A and B, compared to the control group, with the exception of vanadium. However, there were no statistically significant differences ($p > 0.05$) for metallic ions concentrations between Group A and Group B. Based on their results, there are no differences in titanium or other metals concentrations in saliva of patients with healthy or diseased implants.[11]

In the present study, significant results were obtained while comparing the salivary titanium levels among the subjects of the study group and control group. Santos Marino J et al evaluated the survival and success rates of dental implants with a double acid-etched surface treatment with evaluation times up to 10 years post-loading. It included 111 dental implants with a double acid-etched surface. Three groups were created: Group 1 (1–3 years loading), Group 2 (3–5 years loading), and Group 3 (over 5 years loading). Overall, 78 patients were included in the study, who received, in total, 111 dental implants, all replacing single teeth. Mean probing depth was 3.03 mm and mean ISQ was 65.54. Regarding marginal bone loss, in Group 1, 67.6% of implants did not undergo any thread loss, in Group 2, 48.3%, and in Group 3, 59.6%; 59.10% of all implants did not present thread loss with a mean bone loss of 0.552 mm. The implant survival rate was 99.1%, and the success rate was 96.37%. Implants with a double acid-etched surface showed excellent success rates in terms of marginal bone loss, ISQ, and probing depth after up to 10 years of loading, making them a clinically predictable treatment option.[12]

Conclusion

Salivary titanium levels show significant alteration among patients undergoing dental implant therapy.

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