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Original Research

Titanium level in submucosal plaque around healthy implants and implants with peri-implantitis- A comparative study

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ABSTRACT:
Background: Osseo-integrated dental implants have become an increasingly popular modality of treatment for the replacement of absent or lost teeth. The present study evaluated level of titanium in submucosal plaque around implants with peri-implantitis and around healthy implants. **Materials & Methods:** 40 patients with titanium dental implants were included. The level of titanium in submucosal plaque around healthy and peri- implantitis implants was measured using Inductively Coupled Plasma Mass Spectrometry. **Results:** There were 12 males and 8 females in group I and 11 males and 9 females in group II. The mean plaque index was 0.84 in group I and 1.6 in group II. Probing depth was 3.10 in group I and 7.9 in group II and gingival index was 0.60 and 1.62 in group I and group II respectively. The mean titanium level in group I was 0.06 µg and in group II was 0.82 µg. The difference was significant (P< 0.05). **Conclusion:** There was higher titanium level in submucosal plaque around dental implants with signs of peri- implantitis than healthy dental implants.
Key words: Dental implants, Peri- implantitis, Titanium

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INTRODUCTION

Osseo-integrated dental implants have become an increasingly popular modality of treatment for the replacement of absent or lost teeth. Dental implants have high rates of long-term survival (≥10 years) when used to support various types of dental prostheses.[1] However, the long-term success of dental implants is not the same or as high as their survival, as functional implants and their restorations may be subject to mechanical and biological complications. Dental implants have revolutionized the field of dentistry.[2] With the invention of dental implants, the limitation offer by FPD or RPD in the form of sensitivity caused by tooth preparation or cervical abrasion or mobility of

adjacent teeth has been minimized.[3] Titanium dental implants have the ability to unite with the bone through structural and functional connection. Titanium dental implants offer excellent Osseointegration ie its ability to unite with the bone. One of the requirements of an ideal dental implant is its capability to resist corrosion.[4] Titanium leads to development of titanium dioxide (TiO2) which is highly resistant to corrosion. It is one of the best biocompatible metals. Though, it has superior properties of resistance to corrosion, a complete prevention cannot be ensured in oral cavity.[5] The present study evaluated level of titanium in submucosal plaque around implants with peri-implantitis and around healthy implants.

MATERIALS & METHODS

The present study was conducted among 40 patients with presence of atleast one healthy plus one implant with signs of peri-implantitis. Written consent was obtained from all before starting the study.

Data pertaining to patients such as name, age, gender etc. was recorded. Plaque Index, gingival index and bleeding on probing and/or suppuration at six sites was recorded. Subjects with occurrence of probing depths ≥ 5 mm, bleeding on probing and/or suppuration, and bone loss ≥ 2mm were considered to have peri-implantitis. Patients were divided into 2 groups. Group I healthy and group II (peri-implantitis implants). Submucosal plaque was obtained from each implant and quantitation of titanium by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). DNA isolation and DNA quantification was performed. Results were statistically analyzed. P value less than 0.05 was regarded significant.

RESULTS

Table I Distribution of implants

Parameters	Group I	Group II
Status	Healthy	Peri-implantitis
M: F	12:8	11:9

Table I shows that there were 12 males and 8 females in group I and 11 males and 9 females in group II.

Table II Assessment of parameters

Parameters	Group I	Group II	P value
Plaque index	0.84	1.6	0.04
Probing depth	3.10	7.9	0.002
Gingival index	0.60	1.62	0.01

Table II, graph I shows that mean plaque index was 0.84 in group I and 1.6 in group II. Probing depth was 3.10 in group I and 7.9 in group II and gingival index was 0.60 and 1.62 in group I and group II respectively. The difference was significant (P< 0.05).

Graph I Assessment of parameters

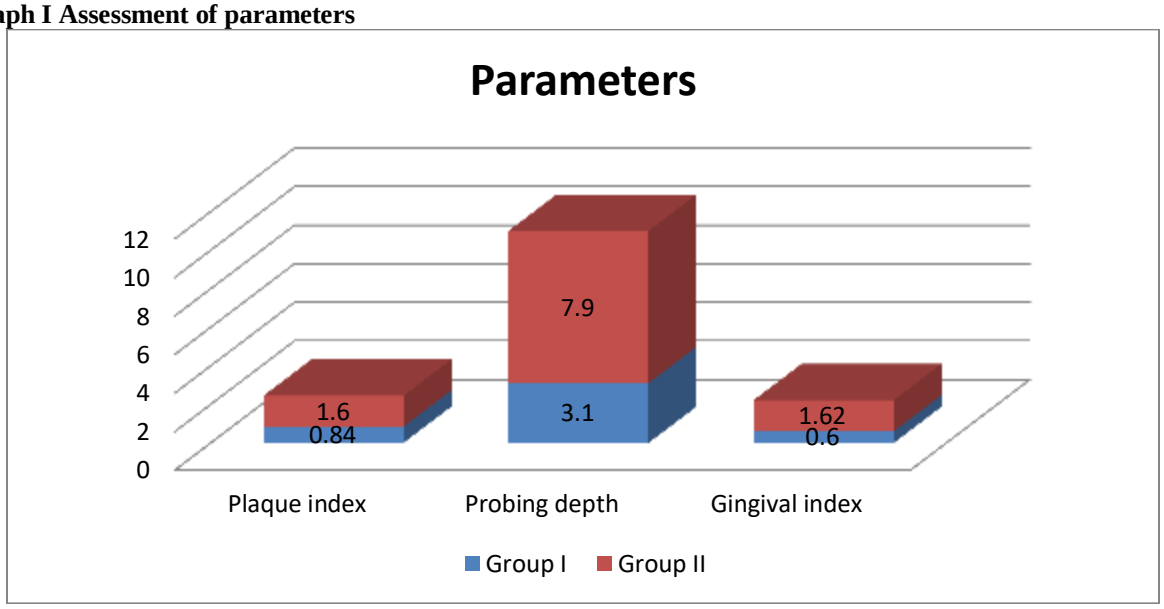
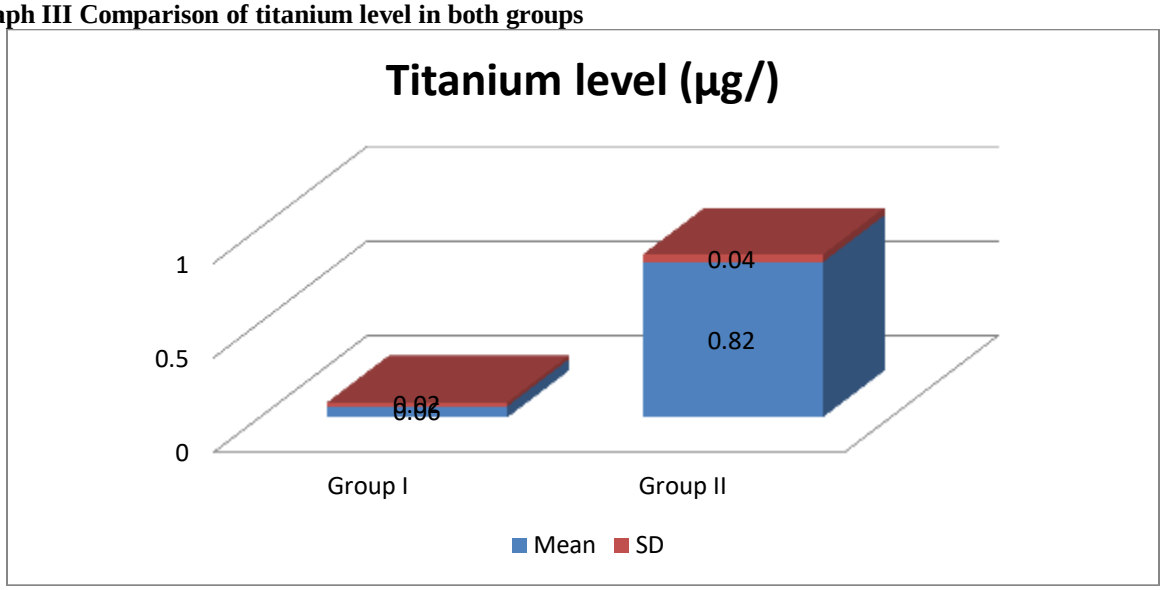


Table III Comparison of titanium level in both groups

Titanium level (µg)	Mean	P value
Group I	0.06	0.02
Group II	0.82	

Table III, graph II shows that mean titanium level in group I was 0.06 µg and in group II was 0.82 µg. The difference was significant (P< 0.05).

Graph III Comparison of titanium level in both groups



DISCUSSION

Biological complications associated with dental implants are mostly inflammatory conditions of the soft tissues and bone surrounding implants and their restorative components, which are induced by the accumulation of bacterial biofilm.[6] Such conditions, which have been named peri-implant mucositis and peri-implantitis, need to be clearly defined and differentiated from a state of peri-implant health, so that the clinician may assign a proper diagnosis and select a proper treatment modality in cases where disease is present.[7] The present study assessed level of titanium in submucosal plaque around implants with peri-implantitis as compared to healthy implants.[8] The present study evaluated level of titanium in submucosal plaque around implants with peri-implantitis and around healthy implants.

In this study, group I had healthy and group II had peri-implantitis. There were 12 males and 8 females in group I and 11 males and 9 females in group II. Safioti et al[9] conducted a study on 30 patients in which submucosal plaque from 20 implants with peri-implantitis and 20 healthy implants was collected and subjected to coupled plasma mass spectrometry (ICP-MS) to determine levels of titanium. Implants with peri-implantitis revealed mean titanium levels of 0.85 ± 2.47 and those with healthy implants showed 0.07 ± 0.19 which was significantly higher (P< 0.05).

We observed that mean plaque index was 0.84 in group I and 1.6 in group II. Probing depth was 3.10 in group I and 7.9 in group II and gingival index was 0.60 and 1.62 in group I and group II respectively. During the last 10 to 15 years, there has been a general agreement that following the first year in function, bone loss around dental implants ≥2 mm represents peri-implantitis. Recent data suggest that the pattern of bone loss in general is not linear. Typically, the development of peri-implantitis appears within the first few years after which the implant is in function.[10] This suggests that it is important to carefully monitor changes that may occur around dental implants in the early post-restorative phase, with focus on bleeding on probing/suppuration and in combination with radiographic evidence of bone loss. From the clinical perspective, it is important to recognize that there is no predictable model or algorithm to predict the progression of peri-implantitis based on diagnostic methodologies currently available in daily practice.[11]

We found that mean titanium level in group I was 0.06 µg and in group II was 0.82 µg. Pettersson et al[12] conducted an invivo animal study on digs and evaluated amount of titanium released into the surrounding bone during placement of implants with different surface structure. Ti was abraded to the surrounding bone upon insertion of a dental implant and the surface roughness of the implant increased the amount of Ti found.

Diameter and total area of the implant were of less importance for the Ti released to the bone. No visible damages to the implant surfaces could be identified in SEM after placement.

CONCLUSION

Authors found that there was higher titanium level in submucosal plaque around dental implants with signs of peri- implantitis than healthy dental implants.

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