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Evaluation of procalcitonin level in saliva and in peri-implant crevicular fluid in peri- implantitis, peri- mucositis and in healthy subjects

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ABSTRACT:

Background:The present study evaluated level of PCT in saliva as well as in PICF in peri-implantitis along with healthy subjects.

Materials & Methods: 25 patients of peri-implant mucositis (group I), 25 of peri- implantitis (group II) and 25 healthy controls (group III) were assessed for peri-implant plaque index, probing depth, and bleeding on probing at four sites per implant was performed. The measurement of PCT in saliva and peri- implant crevicular fluid was performed.

Results: The mean salivary flow rate was 0.61 ml/ minute in group I, 0.64 ml/ minute in group II and 0.63 ml/ minute in group III. The mean salivary procalcitonin level was 3.12 pg/mL in group I, 18.4 pg/mL in group II and 48.5 pg/mL in group III. The mean PICF flow rate was 0.75 µl/minute in group I, 0.93 µl/minute in group II and 1.05 µl/minute in group III. The mean PICF procalcitonin level was 7.28 pg/mL in group I, 41.3 pg/mL in group II and 118.6 pg/mL in group III.

Conclusion: Higher level of salivary and peri- implant crevicular fluid level of procalcitonin in peri- implantitis and peri- mucositis patients as compared to healthy subjects.

Key words: Procalcitonin, Peri- implantitis, Peri- mucositis

INTRODUCTION

The biggest advancement in the field of dentistry is dental implant. It is regarded as the new era where the missing teeth can be replaced by most recent treatment option. In edentulous sites, one or more dental implants can be placed with proper treatment planning.[1] It is easiest and successful method. Though, the survival rate of dental implants is high, the occurrence of peri-implant mucositis and peri- implantitis cannot be completely prevented. These two conditions are the biggest complaint which requires immediate intervention.[2]

Clinically, peri- implant mucositis manifests as visible mucosal inflammation around dental implants and patients complains of bleeding on slight provocation. Other findings include suppuration, redness around gingiva, increased pocket depth, gingival recession and bone loss

around dental implants. Radiographs reveal significant bone loss.[3]Peri- implantitis is mentioned as inflammation around dental implants characterized by bone loss and increased probing depth. It is mild when little bone loss is seen, moderate with significant bone loss and advanced with excessive bone loss with marked probing depth.[4]

It is evident that poor oral hygiene is the leading cause of peri- implant mucositis and peri-implantitis. Failure to remove plaque, use of smoking form of tobacco and genetics play an important role in progression of the conditions.[5] Certain proteins such as procalcitonin (PCT) increase in saliva in reaction to bacterial infection and tissue injury. It is assumed that the level of PCT elevates in saliva and peri implant crevicular fluid (PICF) in peri- implant mucositis and peri- implantitis.[6] Considering this, we attempted to evaluate level of PCT in saliva as well as in PICF in peri- implantitis along with healthy subjects.

METHODOLOGY

Fifty patients who received dental implants in last 5 years with signs of peri- implant mucositis and peri- implantitis were selected for the study. 25 healthy subjects were also enrolled as controls. The inclusion criteria were patients age ranged 18-40 years of either sex, non- smokers, not on long standing steroid therapy. Exclusion criteria were pregnant women and patients beyond specified age group and those not willing to participate in the study. The study was presented to Review and ethical committee of the institution where after assessing various factors the study got approved.

After subjects agreed to give their written consent were divided into 3 groups. Group I were those who had signs of peri-implant mucositis, group II patients were those who had signs of peri- implantitis (>3 mm bone loss, > 6 mm probing depth) and group III subjects were healthy controls. Oral examination was performed in all subjects. Assessment of Peri-implant plaque index, probing depth, and bleeding on probing at four sites per implant was performed. Crestal bone loss was measured radiographically with the help of digital intraoral radiograph. On the day of collection of saliva for the measurement of PCT, all patients were advised to refrain from breakfast and unstimulated saliva was collected at sterile pipette. Supernatant was separated and salivary procalcitonin measurement was performed with an enzyme-linked immunosorbent assay (ELISA) procalcitonin kit.For the collection of PICF for the measurement of PCT, all subjects were advised to prevent breakfast, brushing and eating. Paper cones were inserted into peri-implant pocket and the samples were collected which were subjected to ELISA procalcitonin kit.Findings of the study were statistically studied using Mann Whitney U test for the significance ($P< 0.05$).

RESULTS

Table I Patients distribution in groups

Groups	Group I	Group II	Group III
Status	Peri-implant mucositis	Peri- implantitis	Healthy
M:F	13:12	11:14	12:13

Table I shows that there were 13 males and 12 females in group I, 11 males and 14 females in group II and 12 males and 13 females in group III.

Table II Recording of periodontal parameters in all groups

Parameters	Group I	Group II	Group III	P value
Bleeding on probing (%)	9.2	32.6	38.1	0.01

Plaque index (%)	10.4	27.3	35.4	0.05
Probing depth (mm)	1.4	1.9	4.2	0.04
Crestal bone loss (mm)	0.8	1.5	2.3	0.05

Table II, graph I shows that bleeding on probing was 9.2% in group I, 32.6% in group II and 38.1% in group III. Plaque index was 10.4% in group I, 27.3% in group II and 35.4% in group III. Probing depth was 1.4 mm in group I, 1.9 mm in group II and 4.2 mm in group III. Crestal bone loss was 0.8 mm in group I, 1.5 mm in group II and 2.3 mm in group III. A significant difference was observed between all groups (P< 0.05).

Graph IRecording of periodontal parameters in all groups

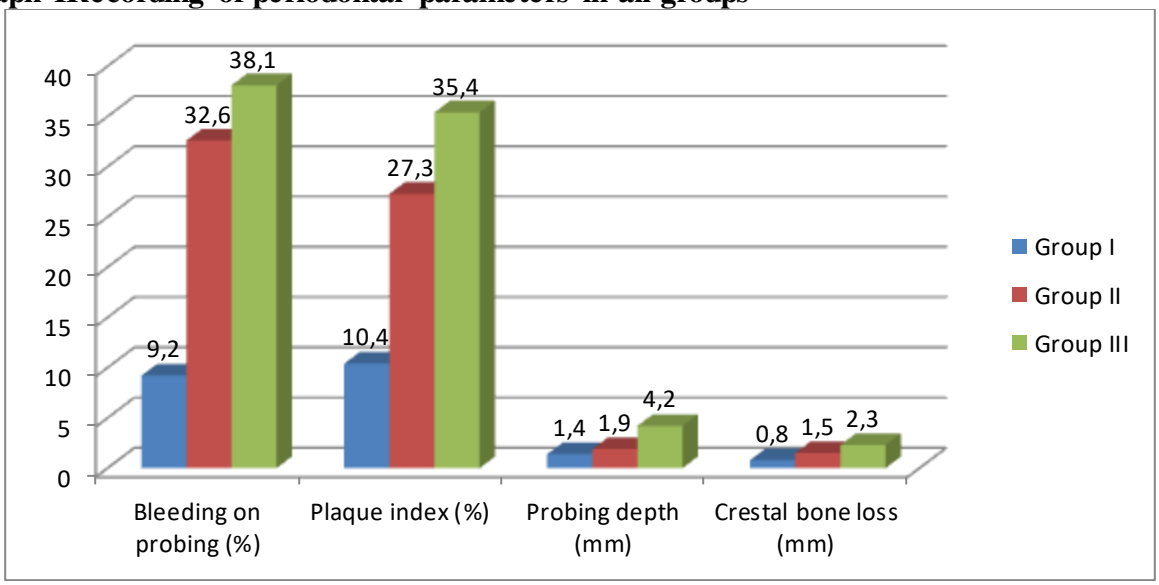

Table IIIRecording of parameters in all groups

Parameters	Group I	Group II	Group III	P value
Salivary flow rate (ml/ min)	0.61	0.64	0.63	0.91
Salivary procalcitonin (pg/mL)	3.12	18.4	48.5	0.001
PICF flow rate (µl/min)	0.75	0.93	1.05	0.12
PICF procalcitonin (pg/ mL)	7.28	41.3	118.6	0.001

Table III, graph II shows that mean salivary flow rate was 0.61 ml/ minute in group I, 0.64 ml/ minute in group II and 0.63 ml/ minute in group III. The mean salivary procalcitonin level was 3.12 pg/mL in group I, 18.4 pg/mL in group II and 48.5 pg/mL in group III. The mean PICF flow rate was 0.75 µl/minute in group I, 0.93 µl/minute in group II and 1.05 µl/minute in group III. The mean PICF procalcitonin level was 7.28 pg/mL in group I, 41.3 pg/mL in group II and 118.6 pg/mL in group III. A statistical significant difference for all parameters was found between groups (P< 0.05).

DISCUSSION

Saliva is secreted by major salivary and mucous glands. It has both organic and inorganic constituents which is essential to carry out essential functions in the body. It aids in digestion,

bolus formation, buffering, lubrication and retention of dentures etc. It has role in detection of caries, sjogren syndrome, periodontal disease and oral cancer. It is found that salivary analysis is helpful in evaluation of the severity of the disease.[7] Recent data mention salivary biomarkers such as matrix metalloproteinases, elastase, interleukins, C-reactive proteins are linked to periodontal disease. PCT is liberated from C cells of thyroid gland and neuroendocrine cells of the lungs in the presence of inflammatory mediators and bacterial toxins. It is a potent biomarker in periodontal diseases.[8]The present study evaluated the level of PCT in saliva as well as in PICF in peri- implantitis along with healthy subjects.

In present study, patients were classified into 3 groups. Group I were of peri-implant mucositis, group II patients were of peri- implantitis and group III subjects were healthy controls. There were 13 males and 12 females in group I, 11 males and 14 females in group II and 12 males and 13 females in group III.Algohar et al[9] included 60 subjects (group I (control), group II (peri-implant mucositis), group III- peri-implantitis). Study showed more BOP, PD, peri-implant plaque index and crestal bone loss in group III in contrast to group II and I. PCT level found to be significant higher in group II and III. A significant positive correlation was found between PICF procalcitonin levels and periodontal parameter in group III, whereas group II exhibited significant positive correlation between PICF and BOP. Group III showed positive correlation between PCT and BOP.

We observed higher values for bleeding on probing, plaque index, probing depth and crestal bone loss in group II and III as compared to group I. The difference found to be significant between all groups. Hendek et al[10] in their study on 72 non-smokers subjects, 21 had chronic periodontitis, 14 had generalized aggressive periodontitis (GAgP), 18 had gingivitis and 19 were healthy subjects. Results of the study showedlowest salivary ProCT level in the healthysubjects followed by gingivitis group, the CP group and highest in the GAgP group. A positive correlation existed between the mean salivary ProCT level and GI, CAL, and PD. These differences were statistically significant.

In this study, mean salivary flow rate was 0.61 ml/ minute, 0.64 ml/ minute and 0.63 ml/ minute in group I, II and III respectively. The mean salivary procalcitonin level was 3.12 pg/mL, 18.4 pg/mL and 48.5 pg/mL in group I, group II and group III respectively. The mean PICF flow rate was 0.75 µl/minute, 0.93 µl/minute and 1.05 µl/minute in group I, group II and group III respectively. The mean PICF procalcitonin level was 7.28 pg/mL in group I, 41.3 pg/mL in group II and 118.6 pg/mL in group III.It is evident that procalcitonin concentration elevates owing to bacterial invasion leading to sepsis. Our study revealed higher plaque score in peri-implantitis group (group III), which supports the fact that abundant bacteria are present near the diseased implant site. Bacteria of gram-negative origin especially bacilli and spirochetes invade the peri-implant pocket and allow the release of endotoxins. Uzzan et al[11] showed that PCT has short half life and hence is the recommended biomarkers to be assessed for the measurement of severity of disease. Giannopoulou et al[12]in their research mentioned that PCT is better than C-reactive protein in determining periodontal infection.

The limitation of the study is small sample size. The level of Pro-inflammatory cytokines was not measured in present study. Long follow up of the patients was not performed.

CONCLUSION

Authors found higher level of salivary and peri- implant crevicular fluid level of procalcitonin in peri- implantitis and peri- mucositis patients as compared to healthy subjects.

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