

## Original Research

### **Assessment of procalcitonin level in saliva and serum of chronic periodontitis patients following nonsurgical periodontal therapy- A clinical study**

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#### **ABSTRACT:**

**Background:** Periodontitis is a multi-factorial disease caused by the plaque micro-organisms. Although bacteria are primary etiological agents in periodontitis, host response to the infection sustaining is crucial to disease progression. The present study was conducted to assess procalcitonin level in saliva and serum of chronic periodontitis patients following nonsurgical periodontal therapy. **Materials & Methods:** 24 systemically healthy subjects age ranged 30-45 years of both genders with chronic generalized severe periodontitis were included. After saliva and serum collection, clinical parameters such as plaque index, gingival index, gingival bleeding index, probing pocket depth, and clinical attachment were recorded. ProCT was estimated using the enzyme-linked immunosorbent assay. **Results:** Out of 24 patients, males were 10 and females were 14. The mean PI at baseline was 2.32, at 1 month was 0.74 and at 3 months was 0.36. GI was 2.33, 0.81 and 0.28 at baseline, 1 month and 3 months respectively. GBI was 84.1, 24.6 and 12.1 at baseline, 1 month and 3 months respectively. PPD was 6.27, 4.45 and 3.74 at baseline, 1 month and 3 months respectively and CAL was 6.23, 4.75 and 4.28 at baseline, 1 month and 3 months respectively. The mean salivary procalcitonin level was 0.21, at 1 month was 0.14 and at 3 months was 0.12. Serum procalcitonin level at baseline was 0.26, at 1 month was 0.14 and at 3 months was 0.13. The difference was significant ( $P < 0.05$ ). **Conclusion:** There was gradual decrease in serum and salivary procalcitonin level following periodontal therapy.

**Key words:** Periodontal therapy, Procalcitonin, ELISA

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#### **INTRODUCTION**

Periodontitis is a multi-factorial disease caused by the plaque micro-organisms. Although bacteria are primary etiological agents in periodontitis, host response to the infection sustaining is crucial to disease progression.<sup>1</sup> Host inflammatory cells respond to the microorganisms of dental plaque by secreting a number of chemokines and

inflammatory cytokines, whose production is amplified by several bacterial virulence factors, thereby leading to the destruction of periodontal tissues.<sup>2</sup> Periodontal disease results in increase in inflammatory mediators that causes tissue breakdown, such as Acute Phase Proteins (APP) or Acute Phase Reactants (APR), cytokines, pro-inflammatory cytokines, anti-inflammatory

cytokines, prostaglandins which are part of the host immune response.<sup>3</sup>

Host response plays an important role in periodontal pathogenesis. Release of acute-phase reactants like C-reactive proteins (CRP) occurs during the destructive phase of the disease. High-sensitive CRP (hs-CRP) is the most widely investigated acute inflammatory marker in many systemic infections as well as periodontal disease. However, it is a nonspecific inflammatory marker and is raised even in noninflammatory conditions.<sup>4</sup> Procalcitonin (ProCT) is an emerging acute-phase reactant specifically elevated in bacterial infections. ProCT is a precursor of the hormone calcitonin, which is involved in calcium homeostasis. It is composed of 116 amino acids and synthesized by the parafollicular cells (C cells) of the thyroid gland and neuroendocrine cells of the lungs where it is cleaved enzymatically and secreted as calcitonin.<sup>5</sup> The present study was conducted to assess procalcitonin level in saliva and serum of chronic periodontitis patients following nonsurgical periodontal therapy.

**MATERIALS & METHODS**

The present study comprised of 24 systemically healthy subjects age ranged 30-45 years of both genders. All were enrolled after they agreed to participate in the study. Inclusion criteria comprised of patients with chronic generalized severe periodontitis, presence of gingival inflammation, gingival index (GI)  $\geq 2$ , and probing pocket depth (PPD)  $\geq 5$  mm. Patients who were currently under any medication and who have taken antibiotics or anti-inflammatory drugs for the past 3 months, Pregnant, lactating females and smokers were also excluded. Demographic data such as name, age, gender etc. was recorded. After saliva and serum collection, clinical parameters such as plaque index, gingival index, gingival bleeding index, probing pocket depth, and clinical attachment were recorded, and scaling and root debridement were performed. Re-evaluation was done at 1- and 3-month interval. ProCT was estimated using the enzyme-linked immunosorbent assay. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

Total- 24		
Gender	Males	Females
Number	10	14

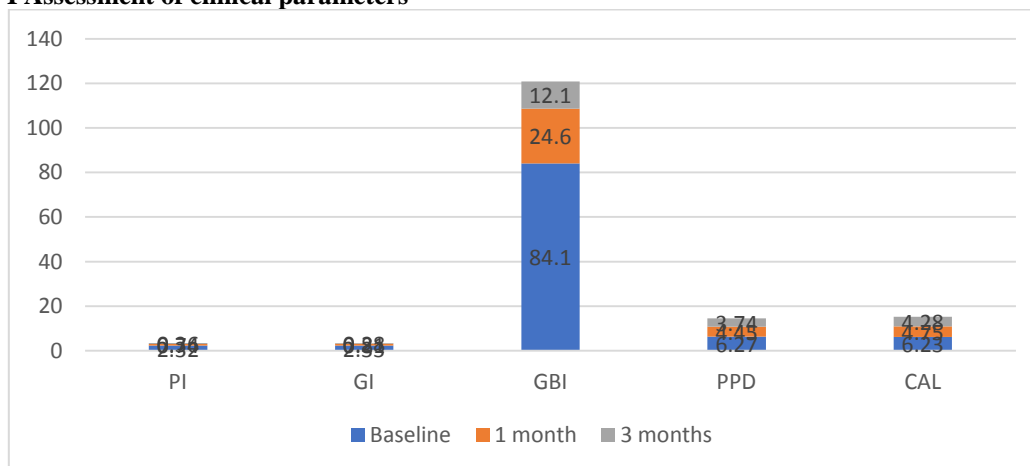
Table I shows that out of 24 patients, males were 10 and females were 14.

**Table II Assessment of clinical parameters**

Parameters	Baseline	1 month	3 months	P value
PI	2.32	0.74	0.36	0.01
GI	2.33	0.81	0.28	0.03
GBI	84.1	24.6	12.1	0.04
PPD	6.27	4.45	3.74	0.02
CAL	6.23	4.75	4.28	0.05

Table II, graph I shows that mean PI at baseline was 2.32, at 1 month was 0.74 and at 3 months was 0.36. GI was 2.33, 0.81 and 0.28 at baseline, 1 month and 3 months respectively. GBI was 84.1, 24.6 and 12.1 at baseline, 1 month and 3 months respectively. PPD was 6.27, 4.45 and 3.74 at baseline, 1 month and 3 months respectively and CAL was 6.23, 4.75 and 4.28 at baseline, 1 month and 3 months respectively. The difference was significant ( $P < 0.05$ ).

**Graph I Assessment of clinical parameters**



**Table III Salivary and serum procalcitonin levels**

Parameters	Baseline	1 month	3 months	P value
Salivary Procalcitonin	0.21	0.14	0.12	0.04
Serum Procalcitonin	0.26	0.14	0.13	0.01

Table III shows that mean salivary procalcitonin level was 0.21, at 1 month was 0.14 and at 3 months was 0.12. Serum procalcitonin level at baseline was 0.26, at 1 month was 0.14 and at 3 months was 0.13. The difference was significant ( $P < 0.05$ ).

## DISCUSSION

Saliva is a combination of complex compounds which are secreted by the mucous and salivary glands of the body. It is composed mainly of proteins and other biomolecules which are responsible for maintaining the oral health of the individual.<sup>6</sup> Saliva helps in various other functions including digestion, enzyme activation, lubrication and buffering. Saliva is not only responsible for physiologic functions but is also a very good tool in assessing and diagnosing different oral and systemic diseases such as caries risk, periodontal disease, Sjogren syndrome and cancers. The severity of the disease can also be found out through salivary analysis.<sup>7</sup> As it is reported in studies that salivary biomarkers such as elastase, interleukins, matrix metalloproteinases, C-reactive proteins are closely related to periodontal disease it can be speculated that the disease progression encountered during periodontal disease is somewhat similar to what is seen in peri-implant disease.<sup>8</sup>

Procalcitonin has been identified as one of the elevated proteins in response to bacterial infections and tissue injury. It is a peptide precursor of hormone calcitonin protein which is involved mainly in balancing the calcium levels in the body.<sup>9</sup> Procalcitonin is released from the C-cells of the thyroid gland and neuroendocrine cells of the lungs, in response to bacterial toxins and pro-inflammatory mediators such as interleukin-6, interleukin-1 $\beta$  and tumor necrosis factor- $\alpha$ , respectively.<sup>10</sup> The present study was conducted to assess procalcitonin level in saliva and serum of chronic periodontitis patients following nonsurgical periodontal therapy.

In present study, out of 24 patients, males were 10 and females were 14. Renjith et al<sup>11</sup> analyzed and correlate the changes in saliva and serum ProCT in periodontitis patients before and after nonsurgical periodontal therapy in 15 chronic periodontitis patients, Salivary ProCT was significantly greater than its serum counterpart at baseline and 1 month after periodontal therapy (0.20 vs. 0.26, 0.13 vs. 0.14 ng/ml respectively). We noticed a significant reduction in salivary as well as serum ProCT (35% and 46%, respectively) 1 month after scaling and root debridement. A significant moderate positive correlation was found between paired observations of salivary and serum ProCT at baseline as well as after periodontal therapy ( $r = 0.61$  and  $0.7$ ). A further reduction of salivary ProCT was noticed 3 months after nonsurgical therapy (0.11 ng/ml).

We found that mean PI at baseline was 2.32, at 1 month was 0.74 and at 3 months was 0.36. GI was

2.33, 0.81 and 0.28 at baseline, 1 month and 3 months respectively. GBI was 84.1, 24.6 and 12.1 at baseline, 1 month and 3 months respectively. PPD was 6.27, 4.45 and 3.74 at baseline, 1 month and 3 months respectively and CAL was 6.23, 4.75 and 4.28 at baseline, 1 month and 3 months respectively. Akula et al<sup>12</sup> compared the levels of Salivary Procalcitonin in Chronic Periodontitis patients with Hypothyroidism before & after non-surgical periodontal therapy. Thirty hypothyroid patients with chronic periodontitis aged between 35-50 years were equally divided into Group A (oral hygiene instructions) and Group B (NSPT+ oral hygiene instructions) selected from an outpatient department from general hospital in Hyderabad. Intergroup assessment showed better improvement of clinical and biochemical variables in Group B when compared to Group A which was statistically significant.

We observed that mean salivary procalcitonin level was 0.21, at 1 month was 0.14 and at 3 months was 0.12. Serum procalcitonin level at baseline was 0.26, at 1 month was 0.14 and at 3 months was 0.13. Bassim et al<sup>13</sup> observed a reduction in salivary ProCT levels 3 months after periodontal therapy, but it was not statistically significant. This may be due to heterogeneity in their patient characteristics where they have included periodontitis patients with varying severity, diabetic patients, and even smokers. Both smoking and poorly controlled diabetes are the common risk factors for periodontitis, and hence, it might have resulted in treatment resistance.

Redman et al<sup>14</sup> used ELISA for both saliva and serum analyses. Even though local secretion may contribute to the salivary component of ProCT, the serum-derived fraction of ProCT might be diluted in the saliva and salivary ProCT is the sum of locally produced and systemically derived components. However, the % of reduction was more in serum than saliva (46 vs. 35) again favouring local production of ProCT by gingival tissues.

## CONCLUSION

Authors found that there was gradual decrease in serum and salivary procalcitonin level following periodontal therapy.

## REFERENCES

1. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand. 1963;21:533-51.

2. Sravya MV, Koduganti RR, Panthula VR, Surya PJ, Gireddy H, Dasari R, et al. Efficacy of an herbal antioxidant as an adjunct to nonsurgical periodontal therapy on procalcitonin levels in smokers with chronic periodontitis. *J Indian Soc Periodontol*. 2019;23:430–5.
3. D Aiuto F, Parkar M, Andreou G, Suvan J, Brett PM, Ready D, et al. Periodontitis and systemic inflammation: Control of the local infection is associated with a reduction in serum inflammatory markers. *J Dent Res*. 2004;83:156–60.
4. Leira Y, Ameijeira P, Domínguez C, Leira R, Blanco J. High serum procalcitonin levels in patients with periodontitis and chronic migraine. *J Periodontol*. 2018;89:1069–74.
5. Onder C, Sivge K, Balci N, Tayman A, Guney Z, Serdar M, et al. The effects of nonsurgical periodontal therapy on serum levels of procalcitonin in patients with chronic and aggressive periodontitis. *PONTE Int Sci Res J*. 2016;72.
6. Kurgan Ş, Fentoğlu Ö, Önder C, Serdar M, Eser F, Tatakis DN, et al. The effects of periodontal therapy on gingival crevicular fluid matrix metalloproteinase-8, interleukin-6 and prostaglandin E2 levels in patients with rheumatoid arthritis. *J Periodontal Res*. 2016;51:586–95.
7. Page RC. The etiology and pathogenesis of Periodontitis. *Compend Contin Educ Dent* 2002; 23(5):11-4.
8. Kim J, Amar S. Periodontal disease and systemic conditions: A bidirectional relationship. *Odontology* 2006;94:10-21.
9. Aimatti M, Romano F, Nessi F. Microbiologic analysis of periodontal pockets and carotid atheromatous plaque in advanced chronic periodontitis patients. *J Periodontol* 2007;78:1718-23.
10. Cairo F, Gaeta C, Dorigo W. Periodontal pathogens in atheromatous plaques: A controlled clinical and laboratory trial. *J Periodontol Res* 2004;39:442-6.
11. Renjith A, Sujatha L. Estimation and correlation of procalcitonin in saliva and serum of chronic periodontitis patients before and after nonsurgical periodontal therapy: An analytical comparative study. *Journal of Indian Society of Periodontology*. 2021 Jan 1;25(1):29.
12. Akula M. Evaluation of salivary procalcitonin levels in chronic periodontitis patients with hypothyroidism before & after nonsurgical periodontal therapy-a clinical study. *International Journal of Medical Science And Diagnosis Research*. 2020 Mar 27;4(3).
13. Bassim CW, Redman RS, DeNucci DJ, Becker KL, Nylen ES. Salivary procalcitonin and periodontitis in diabetes. *J Dent Res*. 2008;87:630–4.
14. Redman RS, Kerr GS, Payne JB, Mikuls TR, Huang J, Sayles HR, et al. Salivary and serum procalcitonin and C-reactive protein as biomarkers of periodontitis in United States veterans with osteoarthritis or rheumatoid arthritis. *Biotech Histochem*. 2016;91:77–85.