

Original Research

Evaluation of CRP in peri-implantitis patients

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ABSTRACT:

Aim: To evaluate the CRP levels in peri-implantitis patients. **Materials and methods:** This study examines the effects of dental implants on systemically healthy adult patients aged 20–75 years who required implants in either jaw. A total of 30 patients were enrolled based on specific inclusion criteria, including voluntary participation and the absence of underlying medical conditions or medication use. Data analysis was done using SPSS software. **Results:** The patients' ages ranged from 20 to 75 years, with a mean age of 36.1 ± 15.37 years. Pre-treatment CPSS values varied between 39 and 163, with a mean of 89.13 ± 32.24 , while post-treatment CPSS showed a reduction, ranging from 14 to 151, with a mean of 45.03 ± 55.02 . Similarly, pre-treatment hs-CRP levels ranged from 0.71 to 5.11 mg/L, averaging 3.12 ± 2.17 mg/L, whereas post-treatment values ranged from 0.04 to 5.63 mg/L, with a mean of 2.01 ± 0.63 mg/L. **Conclusion:** The study showed a decrease in the number of participants with elevated hs-CRP levels after scaling and root planing (SRP), while the number of participants with lower hs-CRP levels increased. This suggests that SRP contributed to a reduction in systemic inflammation.

Keywords: inflammatory, scaling, implant

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INTRODUCTION

Peri-implantitis is fundamentally similar to adult periodontitis and is characterized by an inflammatory response leading to the loss of supporting bone around a dental implant. Despite its clinical significance, there are limited studies on the peri-implant tissues of failed implants in humans.^{1,2}

Peri-implantitis often progresses without noticeable symptoms and is typically identified during routine recall visits. Bleeding on probing is a key indicator, except in some smokers, along with other clinical signs such as suppuration, increased probing depths from baseline, mucosal recession, the presence of a draining sinus, and peri-implant mucosal swelling. If left undiagnosed and untreated, peri-implant disease can lead to complete loss of osseointegration and ultimately result in implant failure.^{3,4}

It remain a common complication, sometimes leading to implant and prosthesis failure. Inflammatory mediators such as C-reactive protein (CRP), fibrinogen, and cytokines are elevated in patients with periodontal diseases, with interleukin-6 (IL-6) playing a key role as a pro-coagulant cytokine. IL-6 induces CRP expression, further amplifying pro-inflammatory and pro-coagulant responses, though studies suggest that appropriate periodontal treatment can help reduce these elevated levels.^{5,6}

Hence the study aimed to evaluate the CRP levels in peri-implantitis patients.

Materials and methods

This study examines the effects of dental implants on systemically healthy adult patients aged 20–75 years who required implants in either jaw. A total of 30 patients were enrolled based on specific inclusion criteria, including voluntary participation and the absence of underlying medical conditions or medication use. Exclusion criteria included a history of corticosteroid use, previous orthopedic treatments, or prior dental implants. Demographic details were recorded, followed by an oral examination and CBCT assessment of bone quality. Additionally, 5 ml of venous blood was collected to measure titanium and aluminum ion levels. The implantation was performed following standard protocols.

Postoperative follow-ups were conducted to monitor clinical outcomes and evaluate the potential effects of the implants over time. Data analysis was done using SPSS software.

Results

Table 1: Patient Data Summary – Pre- and Post-Treatment CPSS and hs-CRP Levels

| Parameter | Minimum | Maximum | Mean ± SD |
|------------------------------|---------|---------|---------------|
| Age (years) | 20 | 75 | 36.1 ± 15.37 |
| Pre-treatment CPSS | 39 | 163 | 89.13 ± 32.24 |
| Post-treatment CPSS | 14 | 151 | 45.03 ± 55.02 |
| Pre-treatment hs-CRP (mg/L) | 0.71 | 5.11 | 3.12 ± 2.17 |
| Post-treatment hs-CRP (mg/L) | 0.04 | 5.63 | 2.01 ± 0.63 |

Abbreviations: CPSS, Clinical Periodontal Sum Score; hs-CRP, high-sensitivity C-reactive protein.

The study included participants aged between 20 and 75 years, with a mean age of 36.1 ± 15.37 years. The pre-treatment CPSS ranged from 39 to 163, with a mean of 89.13 ± 32.24 , while post-treatment CPSS values varied from 14 to 151, with a mean of 45.03 ± 55.02 . Pre-treatment hs-CRP levels ranged from 0.71 to 5.11 mg/L, averaging 3.12 ± 2.17 mg/L, whereas post-treatment hs-CRP levels were between 0.04 and 5.63 mg/L, with a mean of 2.01 ± 0.63 mg/L.

Table 2: Occurrence of hs-CRP at baseline versus post-treatment

| | Hs-CRP ≥ 3 | Hs-CRP < 3 | Total | Occurrence of increased hs-CRP |
|----------|-----------------|--------------|-------|--------------------------------|
| Baseline | 9 | 6 | 15 | 60% |
| Post-SRP | 7 | 8 | 15 | 46.67% |

At baseline, 9 out of 15 participants had hs-CRP levels ≥ 3 , resulting in an occurrence rate of 60%, while 6 participants had hs-CRP levels < 3 . Following scaling and root planing (SRP), the number of participants with hs-CRP levels ≥ 3 decreased to 7, while those with hs-CRP < 3 increased to 8, leading to a reduced occurrence rate of 46.67%.

Discussion

C-reactive protein (CRP) levels are higher in individuals with peri-implantitis compared to healthy controls. Studies show that the mean CRP level in peri-implantitis patients is 0.615 mg/dL, while in healthy controls, it is 0.201 mg/dL. CRP levels also appear to increase with the severity of peri-implant diseases, showing a positive correlation between CRP levels and peri-implant health status. This suggests that CRP can be a useful biomarker for diagnosing and monitoring peri-implant diseases.^{7,8}

CRP is an acute-phase reactant, and its production increases due to the pro-inflammatory mediators present during peri-implant disease pathogenesis. Higher CRP levels were found in patients with peri-implantitis, followed by those with peri-implant mucositis, and were lowest in those with peri-implant health. The difference in CRP levels among these groups is statistically significant. Therefore, evaluating CRP levels can help in differentiating between healthy peri-implant conditions and peri-implant diseases.^{9,10}

Our study included participants aged between 20 and 75 years, with a mean age of 36.1 ± 15.37 years. The pre-treatment CPSS ranged from 39 to 163, with a mean of 89.13 ± 32.24 , while post-treatment CPSS values varied from 14 to 151, with a mean of 45.03 ± 55.02 . Pre-treatment hs-CRP levels ranged from 0.71 to 5.11 mg/L, averaging 3.12 ± 2.17 mg/L, whereas post-treatment hs-CRP levels were between 0.04 and 5.63 mg/L, with a mean of 2.01 ± 0.63 mg/L. At baseline, 9 out of 15 participants had hs-CRP levels ≥ 3 , resulting in an occurrence rate of 60%, while 6 participants had hs-CRP levels < 3 . Following scaling and root planing (SRP), the number of participants with hs-CRP levels ≥ 3 decreased to 7, while those with hs-CRP < 3 increased to 8, leading to a reduced occurrence rate of 46.67%. Khichy A, et al.,¹¹ conducted the assessment of C-reactive protein (CRP) and interleukin-6 (IL-6) levels in patients with peri-implantitis. The study included 20 patients diagnosed clinically and radiographically with peri-implantitis, along with 20 healthy controls who had reported for routine health check-ups. All participants were recalled in the morning, and fasting venous blood samples (minimum of 12 hours) were collected using plain vials and sent for biochemical analysis. CRP levels were measured using the latex-enhanced nephelometric method, while IL-6 levels were assessed using an ELISA kit. The results indicated that the mean CRP levels were higher in the peri-implantitis group (0.795 mg/dL) compared to the control group (0.294 mg/dL). Similarly, the mean IL-6 levels were elevated in the peri-implantitis group (12.178 pg/mL) compared to the control group (6.458 pg/mL), with statistical analysis revealing significant differences. The study concluded that peri-implantitis was associated with heightened periodontal inflammation,

accompanied by a significant increase in CRP and IL-6 concentrations. A limitation of our study was the relatively small sample size, which may affect the generalizability of the findings. A larger sample would provide more robust data, allowing for a more comprehensive evaluation of the relationship between hs-CRP levels and peri-implant conditions. Future studies with a greater number of participants are needed to validate these results. Fransson C et al aimed to appraise all available evidence linking peri-implantitis with systemic inflammation. A systematic review was completed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Eight electronic databases (Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, Web of Science, Dentistry & Oral Sciences Source, Scopus, LILACS, and China Online), ClinicalTrials.gov, WHO International Clinical Trials Registry Platform (ICTRP), and gray literature were searched up to February 9, 2023. Human studies of randomized controlled trials, non-randomized intervention studies, cohort studies, case-control, and cross-sectional studies were eligible for inclusion. Quantitative analyses were performed using random effects models. A total of 27 full-text articles were retrieved, and 11 clinical studies were included in the final analyses. All evidence gathered demonstrated a consistent association between peri-implantitis and systemic inflammation. Patients with peri-implantitis exhibited higher levels of serum C-reactive protein (CRP) (standard mean difference (SMD): 4.68, 98.7% CI: 2.12 to 7.25), interleukin-6 (IL-6) (weighted mean difference (WMD): 6.27 pg/mL, 0% CI: 5.01 to 7.54), and white blood cell counts (WMD: 1.16 * 10³/μL, 0% CI: 0.61 to 1.70) when compared to participants without peri-implantitis. Peri-implantitis is associated with higher systemic inflammation as assessed by serum CRP, IL-6, and white blood cell counts. Further research is needed to clarify the nature of this association.⁶

Conclusion

The study showed a decrease in the number of participants with elevated hs-CRP levels after scaling and root planing (SRP), while the number of participants with lower hs-CRP levels increased. This suggests that SRP contributed to a reduction in systemic inflammation.

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