

# A pilot study to assess the impact of periodontal treatment in patients with coronary artery disease

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## ABSTRACT

**Background** Es wird angenommen, dass periodontitis, eine chronische Entzündung, eine systemische Entzündung verursacht, die zwar geringfügig ist, aber über einen längeren Zeitraum anhält, was zur Entwicklung von atherosclerosis beiträgt. Despite the classic risk factors identified, about 40% of coronary artery disease cases remain unaccounted, according to new data. **Objectives:** To assess the efficacy of non-surgical periodontal therapy on the levels of serum inflammatory markers in patients with chronic periodontitis and known coronary artery disease. **Material and Methods:** For this study, the Department of Cardiology at the CSM Medical University in Lucknow, India, recruited twenty subjects with known coronary artery disease (CAD). The clinical parameters of bleeding on probing (BOP) and probing depth (PD) were used to measure periodontal disease. Each patient underwent non-surgical periodontal therapy, which included

**Key words:** Coronary artery disease, high-sensitivity C-reactive protein, periodontitis, tumor necrosis factor- $\alpha$

## INTRODUCTION

Non communicable diseases are taking an epidemic form and by 2020 will be a major cause of death in developing countries. Mehr als 29.8 Millionen Menschen in India haben eine koronare Herzkrankheit. Studien in India haben gezeigt, dass jede zweite Person über 35 Jahren periodontale Pockets hat und dass 30 % der gesamten Zahnentfernungen nach 35 Jahren durch periodontale Krankheit verursacht werden.[2] Es wurde angenommen, dass es eine Verbindung zwischen coronary artery disease (CAD) und periodontal disease gibt, da beide häufig diagnostiziert werden.[2]

Framingham heart study has identified a list of classical

riskante Faktoren wie Hypertension, Geschlecht, Alter, Rauchen, Diabetes mellitus und Übergewicht. Nichtsdestotrotz konnten sie die Ursache dieses multifactorial pathologischen Prozesses nicht ausreichend berücksichtigen. Primary and secondary prevention of CAD's major risk factors has improved, but it still is very common. Around 40% of atherosclerosis cases cannot be linked to the classic risk factors.

Aufgrund dieser Informationen gibt es mehr Interesse daran, chronic infections als Risikofaktor für atherosclerosis zu betrachten.[4] Da inflammatory mechanisms eine wichtige Rolle bei der Mediation aller Stadien von atherosclerosis und destruktiver periodontal disease spielen, wird eine untreatede Krankheit zu einer chronischen Entzündung, was zu einem Anstieg der lokalen und systemischen inflammatory mediators führt. So ist die Verbindung zwischen Perioden und Systemen eine bedeutende aktuelle Angelegenheit in der Periodontologie.

Periodontal associated inflammatory process contributes to an increase in inflammatory mediators including tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), C reactive proteins (CRP) and interleukin- 6 (IL- 6).[5]

Epidemiological studies have associated plasma levels of IL-6 and TNF -  $\alpha$  with cardio vascular risk factors and have associated IL- 6 levels with a risk of CAD.

Thus, the purpose of this interventional survey was to see the effect of periodontal treatment on levels of serum inflammatory markers CRP, TNF- $\alpha$  and white blood cell(WBC) counts.

## MATERIALS AND METHODS

Twenty subjects were recruited from the Department of Cardiology, CSM Medical University, Lucknow, India, for the survey. Subjects with a chronic generalized periodontitis having coronary artery disease confirmed by clinical findings and ECG as interpreted by a cardiologist were included in the study.

Exclusion criteria included current smoking, smoking within last 6 months, diabetes and acute/chronic systemic diseases (e.g. influenza, rheumatoid arthritis, COPD, or kidney disease), antibiotics or anti inflammatory drug administration within the last 2 months, and pregnancy/lactation.

### **Clinical periodontal parameters**

Probing depth was recorded at six sites per tooth (mesio

mündliche, mittlere und distale mündliche, mesio-, mittlere und distale mündliche). Die Tiefe der Probe wurde mit der Probe UNC 15 auf den nächsten Millimeter gemessen.

The presence or absence of bleeding was recorded using Sulcular Bleeding Index (SBI, Muhlemann and Son 1971).<sup>[7]</sup>

All subjects received oral prophylaxis and sublingual scaling and root planing. Oral hygiene instructions were given and the subjects were recalled 1 month after the last treatment visit.

### **Serum inflammatory markers**

Serum high-sensitivity C reactive protein (hsCRP) was measured by using particle-enhanced turbidimetric assay (hsCRP, latex, COBAS, Integra 400 plus, ROCHE, Basel, Switzerland). Precipitate was determined turbidimetrically at 552 nm. The lower limit of assay was 0.1 mg/ml.

TNF- $\alpha$  serum levels were determined by sensitive enzyme-linked immunosorbent assay (ELISA) using commercially available kit (R and D systems Inc, Minneapolis, MN, USA). The lower limit of detection was 0.06 pg/ml. The plates were read using an automated microplate reader (Bio Rad, Hercules, California, USA).

WBC count ( $\times 10^9$ ) was obtained.

All the parameters (PD, BOP, hsCRP, TNF- $\alpha$ , WBC counts) were obtained at the baseline and 1 month post treatment.

### **Statistical analysis**

The data collected were analyzed using non parametric Wilcoxon signed rank test. *P* values  $\leq 0.05$  were considered statistically significant.

### **RESULTS**

There was a statistically significant reduction in BOP and PD post treatment. BOP was reduced by 28% and PD was reduced by 41% at the end of 1 month [Table 1].

hsCRP and WBC levels were significantly reduced post treatment. However, the levels of TNF  $\alpha$  were not significantly reduced. The hsCRP, TNF- $\alpha$  levels and WBC counts reduced by 18, 2, and 14%, respectively [Table 2].

### **DISCUSSION**

The present study was conducted with the purpose of detecting the role of non surgical periodontal therapy in

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**Table 1: Data on periodontal disease markers before and after treatment**

Parameters	Baseline	Post treatment	Change
Bleeding on probing (%)			
(mean ± SD)	66.6 (± 1.4)	48.1 (± 5.7)	18.5
Probing depth(mm)			
(mean ± SD)	4.40 (± 0.80)	2.60 (± 0.78)	1.8

**Table 2: Data on serum inflammatory markers before and after treatment**

Inflammatory markers	Baseline	Post treatment	Change
hsCRP (mg/L)			
(mean ± SD)	2.54 (± 0.31)	2.08 (± 0.31)	0.46
TNF α (pg/ml)			
(mean ± SD)	1.79 (± 0.13)	1.59 (± 0.13)	0.20
WBCs (109/L)			
(mean ± SD)	8.04 (± 1.08)	6.90 (± 0.87)	1.14

subjects with coronary artery disease. The study clearly showed that there was a significant reduction in the levels of serum inflammatory markers (hsCRP and WBC counts) after periodontal therapy. The study is in agreement with the results of previous studies<sup>[6-10]</sup> that stated a reduction in systemic inflammatory markers of inflammation associated with periodontitis post treatment.

In this study, non surgical therapy alone produced significant improvements in various periodontal parameters. BOP is an informative parameter to estimate the severity of gingival inflammation as well as the response to treatment, and it is a clinical indicator of disease progression and stability<sup>[11]</sup>. BOP ≤ 20% of sites is associated with a lower risk for periodontal attachment loss. In the present study, BOP was significantly reduced 1 month after treatment, and the number of subjects with BOP >20% of sites at baseline was reduced by almost half after therapy. Similarly, all subjects experienced significant reductions in PD after the treatment.

In this study, 1 month after mechanical therapy, the circulating levels of hsCRP and WBC counts significantly reduced in all subjects. CRP is a prognostic marker for future cardiovascular events.<sup>[12]</sup> The release of bacteria and proinflammatory mediators such as bacterial endotoxins and cytokines in the bloodstream that causes the release of acute phase reactants (such as C reactive protein) leading to increased inflammatory activity in atherosclerotic lesions may represent the link between periodontal infection and CAD.

Furthermore, individuals with periodontitis have higher WBC counts. Der WBC-Gehalt, ein grober Indikator für systemische Entzündung, der mit der Vorhersage von zukünftigen Herzerkrankungen verbunden ist<sup>[13]</sup>, sank ebenfalls erheblich

for subjects with CAD. Individuals in our study showed a significant reduction of WBC after 1 month.

TNF-α has a role in apoptosis, bone resorption, matrix metalloproteinase (MMP) and IL-6 production. It has also been associated with increased risk of recurrent coronary events<sup>[14]</sup>. However, the role of TNF-α remains disputed as several studies have not been able to recognize its association to cardiovascular events.<sup>[15]</sup> Also, in our study there was no significant reduction in the levels of TNF-α. Large sample size is required to justify the association of TNF-α.

Die Tatsache, dass periodontitis die Risikofaktoren für das Herz-Kreislauf-System beeinflussen kann, kann bedeutende clinical Auswirkungen haben. In erster Linie, da Inflammation eine bedeutende Rolle in der Pathophysiologie verschiedener Erkrankungen spielt (z. B. metabolisches Syndrom, Blutdruck, vaskuläre Gesundheit). Eine grundlegende schwere periodontale Infektion kann die Beziehung zwischen milder chronic inflammation und späteren schweren Ereignissen in observationalen Studien beeinflussen<sup>[16]</sup>. Secondly, pro-atherogenic changes (ansteigender cholesterol) and increased systolic blood pressure caused by periodontitis in

affected individuals may increase the risk of future cardiovascular events. In this preliminary study is proposed that smoking, periodontal infections, and systolic blood pressure have a potential impact on systemic health. Also, cigarette smoking is the most important factor with regard to the association between periodontal infections and systemic inflammation. Still, the causal relationship between periodontitis and CAD cannot be established as the sample size was small and the role of other risk factors was not explored. On the basis of the data obtained, a large scale interventional study could be conducted in future.

## CONCLUSION

- Poor oral health is detrimental to systemic health.
- Inflammatory markers are significantly associated with periodontitis.
- Periodontitis is a modifiable risk factor, which can be prevented and treated.

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