



## Nonsurgical Periodontal Therapy decreases the Severity of Rheumatoid Arthritis: A Case–control Study

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### ABSTRACT

**Introduction:** Rheumatoid arthritis (RA) and periodontitis are common chronic inflammatory conditions. Several studies suggested a relationship between RA and periodontitis. Recent studies have shown a beneficial effect of periodontal treatment on the severity of active RA. So the aim of this study was to examine the effect of nonsurgical periodontal therapy on the clinical parameters of RA.

**Materials and methods:** A total of 60 subjects with moderate-to-severe chronic generalized periodontitis and active RA in the age range 18 to 65 were selected for the study. They were divided into two groups. Group A (control group) consisted of 30 subjects with chronic generalized periodontitis and RA, and group B of 30 subjects with chronic generalized periodontitis and RA and they received nonsurgical periodontal therapy (scaling, root planning, and oral hygiene instructions). Evaluation of clinical observations of Simplified Oral Hygiene Index (OHI-S), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD), clinical attachment level (CAL), number of swollen joints (SJ), number of tender joints (TJ), values of erythrocyte sedimentation rate (ESR), visual analogue scale (VAS) for patient's global assessment, 3 months disease

activity score (DAS) index, and C-reactive protein (CRP) was done at baseline and 3 months. Statistical evaluation of clinical observations was carried out.

**Results:** Group B subjects who received nonsurgical periodontal therapy showed statistically significant improvement in all periodontal and RA parameters at 3 months, compared with group A who did not receive periodontal therapy.

**Conclusion:** It can be concluded from the result that nonsurgical periodontal therapy may contribute to reduction in severity and symptoms of RA.

**Clinical significance:** Rheumatoid arthritis patients should be evaluated for periodontitis and treated for the same in order to reduce its severity level.

**Keywords:** Inflammation, Periodontitis, Rheumatoid arthritis.

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### INTRODUCTION

Growing evidence suggests the link of periodontitis to many systemic diseases. Rheumatoid arthritis (RA) is one of them. Both periodontitis and RRA share the title of being “inflammatory disease” and resulting bone destruction. Periodontitis is defined as “an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession, or both.”<sup>1</sup> Rheumatoid arthritis is a chronic destructive inflammatory disease, characterized by the accumulation and persistence of an inflammatory infiltrate in the synovial membrane that leads to synovitis and the destruction of the joint architecture. Periodontitis and RA share many similar pathological aspects and immunological findings. In both

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diseases, progression consists of the continuing presence of high levels of proinflammatory cytokines. Furthermore, low levels of tissue inhibitors of metalloproteinases, high levels of matrix metalloproteinases, and prostoglandins (PGE<sub>2</sub>) secreted by macrophages, fibroblasts, and other resident and migrating inflammatory cells, characterize the active stage of both diseases.<sup>2</sup> It has been suggested that the bacteria, involved with periodontal disease (PD), are also active in the pathogenesis of RA.<sup>3</sup> Several prospective clinical trials have shown that individuals with RA are more likely to experience moderate-to-severe PD compared with their healthy counterparts.<sup>4</sup> Some research has shown improvement in RA symptoms following successful periodontal treatment.<sup>5-7</sup> This is likely due to the reduction in the oral contribution to the total inflammatory burden, following the favorable periodontal treatment outcome.

Therefore, the aim of this study was to examine the effect of nonsurgical periodontal treatment on the signs and symptoms of RA in patients with PD.

## MATERIALS AND METHODS

A total of 60 subjects aged 18 to 65 years with confirmed diagnosis of active RA and chronic generalized periodontitis, visiting the Department of Medicine and Orthopaedics in People's College of Medical Sciences and Research Centre and Bhopal Fracture Hospital – Bhopal, were selected for the study. A structured questionnaire was answered by each subject to ascertain the following details – history of acute/chronic systemic diseases, periodontal treatment in last 6 months, long-term medication for chronic diseases, xerostomia, subjects with habits, such as alcohol use, smoking, tobacco chewing, and pregnant and lactating women. Subjects with any of the above risk factors were excluded from the study. Those included in the study were with a confirmed diagnosis of active RA<sup>8</sup> and chronic generalized periodontitis<sup>1</sup> after controlling for the above-mentioned risk factors. Subjects were randomly divided into two groups:

*Group A (control group)* consisted of 30 subjects who did not receive nonsurgical periodontal therapy.

*Group B (test group)* consisted of 30 subjects who received nonsurgical periodontal therapy (scaling, root planning, and oral hygiene instructions).

Assessment of periodontal status was done by Simplified Oral Hygiene Index (OHI-S) (Greene and Vermillion 1964),<sup>9</sup> gingival index (GI) (Loe and Silness 1963),<sup>9</sup> mean percentage of bleeding sites – (the presence or absence of gingival bleeding is determined by gentle probing of the gingival crevice with a periodontal probe. The appearance of bleeding within 10 seconds indicates a positive score which was expressed as a percentage of the total number of gingival margins examined),<sup>9</sup> probing

pocket depth (PPD), and clinical attachment level (CAL) measured at six sites per tooth.<sup>9</sup> Clinical and biochemical parameters, which were used to assess the severity of RA were RA disease activity score (DAS-28),<sup>10</sup> which includes swollen joints (SJ), tender joints (TJ), erythrocyte sedimentation rate (ESR), visual analogue scale (VAS) for physician's global assessment, and C-reactive protein (CRP).

Clinical periodontal and RA parameters were measured and recorded at baseline and again after 3 months for both the groups after subjecting group B to nonsurgical periodontal therapy including scaling, root planning, and oral hygiene instructions. Group A patients who did not receive therapy during the study were treated after the end of the study.

The values obtained were used to make a comparative analysis between the two groups (i.e., groups A and B). The data were statistically analyzed to evaluate the effect of nonsurgical periodontal therapy on the signs and symptoms of RA.

To assess all the variables in groups A and B, arithmetic mean and standard deviation were used. To compare all the variables between groups A and B, Student's t test (unpaired) was adopted and p-value was obtained. A p-value of 0.05 was assumed significant.

## OBSERVATION AND RESULTS

The present study did not have any sample loss. All the patients placed in their respective group finished the study. The average age was 51 ± 9.2 and 49 ± 10.3 respectively in groups A and B. Females constituted 87% of the subjects in group A and 83% in group B.

The baseline periodontal and RA parameters are in Tables 1 and 2 respectively. All periodontal and RA parameters showed no statistical difference in groups A and B at baseline except OHI-S and mean percentage of sites with bleeding on probing (BOP), which was found to be statistically significant with  $p < 0.05$ .

The OHI-S, GI, and percentage of BOP significantly improved with  $p < 0.0001$  in group B patients who received nonsurgical periodontal therapy. The PPD also reduced significantly in group B patients 3 months posttreatment ( $p < 0.0001$ ). There was a significant gain in CAL in group B patients, 3 months after the treatment ( $p < 0.0171$ ). Based on DAS-28 test, group B patients receiving periodontal therapy show significant improvement in DAS-28. Also, when disease activity of subjects was compared on the basis of DAS-28, two patients shifted from high disease activity group to moderate disease activity group, and one patient shifted from moderate disease activity to low disease activity, which showed improvement in overall inflammatory condition (Table 3).

General Assessment score on VAS showed statistically significant improvement in the group B patients compared

**Table 1:** Comparison of mean values of OHI-S, GI, BOP, PPD (mm), and CAL (mm) in groups A and B subjects at baseline

Component		Mean	SD	N	t-value	DF	p-value (5% level)	Result
OHI-S	Group A	3.2287	1.5073	30	2.3771	58	0.0208	S
	Group B	4.0313	1.0717	30				
GI	Group A	2.1847	0.8862	30	1.0886	58	0.2808	NS
	Group B	2.403	0.6492	30				
BOP	Group A	79.8333	27.596	30	3.3756	58	0.0013	S
	Group B	97.3200	6.5943	30				
PPD	Group A	5.296	0.3843	30	0.5906	58	0.5571	NS
	Group B	5.2323	0.4482	30				
CAL	Group A	4.1027	0.9338	30	1.6867	58	0.0970	NS
	Group B	4.5357	1.0513	30				

S: Significant; NS: Nonsignificant

**Table 2:** Comparison of mean values of OHI-S, GI, BOP, PPD (mm), and CAL (mm) in groups A and B subjects at 3 months

Component		Mean	SD	N	t-value	DF	p-value (5% level)	Result
OHI-S	Group A	3.357	1.6215	30	7.1135	58	0.0001	S
	Group B	1.1697	0.4553	30				
GI	Group A	2.38233	0.72317	30	10.3865	58	0.0001	S
	Group B	0.68407	0.52826	30				
BOP	Group A	90.3333	17.3430	30	13.8224	58	0.0001	S
	Group B	31.1593	15.7808	30				
PPD	Group A	5.5283	0.3189	30	12.5200	58	0.0001	S
	Group B	4.2937	0.436	30				
CAL	Group A	4.371	0.8711	30	2.4546	58	0.0171	S
	Group B	3.79	0.9602	30				

S: Significant

**Table 3:** Comparison of number of individuals with low, moderate, and severe disease activity on the basis of DAS-28 at baseline and 3 months for groups A and B patients

	DAS-28					
	Baseline			3 months		
	L	M	S	L	M	S
Group A (n=30)	0	2	28	0	1	29
Group B (n=30)	0	3	27	1	5	24

L: Low disease activity; M: Moderate disease activity; S: Severe disease activity

with group A patients. Subjects receiving periodontal therapy (group B) showed significant improvement in number of TJ ( $p < 0.0008$ ) and SJ ( $p < 0.0001$ ) compared with group A (Tables 4 and 5).

## DISCUSSION

This study showed that subjects suffering from moderate/severe PD and RA, i.e., group B, when receiving nonsurgical periodontal therapy had shown overall improvement in all periodontal and RA parameters.

When groups A and B were compared, subjects in group B who received nonsurgical periodontal therapy showed statistically significant improvement in all periodontal clinical parameters including OHI-S, GI, BOP, PPD, and CAL as compared with untreated subjects in group A at 3 months. These might be related with the reduction of periodontal inflammatory status. These findings are in accordance with the previous studies done by Al-Katma et al<sup>5</sup> and Ortiz et al.<sup>6</sup>

**Table 4:** Comparison of mean values of ESR (mm/hour), VAS, TJ and SJ, DAS-28, CRP at baseline in groups A and B

Component		Mean	SD	N	t-value	DF	p-value (5% level)	Result
ESR	Group A	27.53	7.89	30	1.4717	58	0.1465	NS
	Group B	31.2	11.14	30				
VAS	Group A	58.67	15.02	30	1.4747	58	0.1457	NS
	Group B	65.6	20.91	30				
TJ	Group A	18.87	4.97	30	1.4984	58	0.1395	NS
	Group B	21.13	6.63	30				
SJ	Group A	16.27	5.26	30	0.0413	58	0.9672	NS
	Group B	16.33	7.11	30				
DAS-28	Group A	6.639	0.8941	30	0.7804	58	0.4383	NS
	Group B	6.8537	1.2126	30				
CRP	Group A	3.667	2.026	30	1.3969	58	0.1678	NS
	Group B	4.387	1.966	30				

NS: Nonsignificant

**Table 5:** Comparison of mean values of ESR (mm/hour), VAS, TJ and SJ, DAS-28, CRP in groups A and B at 3 months

Component		Mean	SD	N	t-value	DF	p-value (5% Level)	Result
ESR	Group A	28.2	6.78	30	2.0428	58	0.0456	S
	Group B	24.3	7.96	30				
VAS	Group A	58.33	14.87	30	2.1883	58	0.0327	S
	Group B	50	14.62	30				
TJ	Group A	19	4.43	30	3.5387	58	0.0008	S
	Group B	14.83	4.68	30				
SJ	Group A	16.63	4.49	30	5.6979	58	0.0001	S
	Group B	8.87	5.96	30				
DAS-28	Group A	6.6937	0.7914	30	3.9169	58	0.0002	S
	Group B	5.8027	0.9623	30				
CRP	Group A	3.71	1.688	30	2.0876	58	0.0412	S
	Group B	2.95	1.061	30				

S: Significant

Nonsurgical periodontal therapy of subjects with moderate-to-severe chronic generalized periodontitis and active RA was found to reduce the severity of RA as measured by DAS-28 in group B. There was a statistically significant decrease in the DAS-28 at 3 months in subjects of group B who received nonsurgical periodontal therapy. No such change was observed in untreated group A subjects. It was observed that severe incapacity degree decreased for group B patients. This observed improvement if RA disease activity was found to be independent of disease-modifying drug therapy or other systemic factors since both the groups were matched for common risk factors for both RA and periodontitis. Further, there was no change in the drug prescription during the entire study period for both the groups. Hence, it can be concluded that this decrease in DAS-28 severity was likely to be associated with the periodontal therapy. These findings are in association with other studies done by Ortiz et al,<sup>6</sup> Ribeiro et al,<sup>11</sup> and Al-Katma et al.<sup>5</sup>

Subjects in group B who received nonsurgical periodontal therapy showed statistically significant decrease in the number of TJ and SJ, scores of VAS for physician's global assessment when compared with untreated subjects in group A at 3 months. These findings are similar to results achieved in other studies done by Pinho et al,<sup>7</sup> Ribeiro et al,<sup>11</sup> and Ortiz et al.<sup>6</sup>

Higher values of ESR and CRP are associated with active inflammatory disease. Values of ESR and CRP showed significant reduction after periodontal therapy in group B patients compared with untreated group A patients. Similar results have been reported by Pinho et al,<sup>7</sup> D'Aiuto et al,<sup>12</sup> Ebersole and Cappelli,<sup>13</sup> and Ortiz et al.<sup>6</sup>

Periodontal diseases are systemic inflammatory conditions. Their treatment reduces the overall systemic inflammatory load. The improvement in symptoms related to RA in group B might be due to decrease in inflammatory products in the blood after periodontal therapy.

## CONCLUSION

From the above-mentioned observations of this study, it may be concluded that nonsurgical periodontal therapy may contribute to a reduction in the signs and symptoms of RA.

However, further studies with higher sample size and longer study time may throw more light on the association between RA and chronic periodontitis and the effect of nonsurgical periodontal therapy on the signs and symptoms of RA.

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