



## The Role of Porphyromonas Gingivalis in Rheumatoid Arthritis and Periodontitis by Using Subantimicrobial Dose Doxycycline

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### ABSTRACT

**Purpose:** The current study was directed to estimate the role of porphyromonas gingivalis in the relation between rheumatoid arthritis and periodontitis by using subantimicrobial dose doxycycline. **Subjects and methods:** The current study was accomplished on twenty patients who had mild or moderate chronic periodontitis and rheumatoid arthritis they were partitioned into two groups: Group I; ten patients were exposed to mechanical debridement only and Group II: ten patients were exposed to mechanical debridement added to receiving small dose doxycycline (SDD) as a host modulatory agent (20mg twice daily) for three months. **Results:** group I exhibited a greatly significant improvement in clinical parameter in correlation to group II after three months follow up. Group II showed the statistically significantly lowest percentage decrease in number of bacteria in synovial fluid **Conclusion:** The adjunct use of doxycycline as host modulatory agent improved the treatment outcomes when used with mechanical debridement in rheumatoid arthritis and patients with periodontitis.

### INTRODUCTION

Periodontitis is a standout amongst long-standing systemic conditions of infectious origin with a high prevalence among adults. Aetiology of periodontitis is triggered mainly by twenty diverse bacterial species; the most common bacteria is Porphyromonas gingivalis. Periodontal disease begins as an intense inflammation in the gingival tissues,

### KEYWORDS

*Rheumatoid Arthritis,*  
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which can progress to development of periodontal pockets this lead to teeth loss <sup>(1)</sup>.

Rheumatoid Arthritis (RH) is an inflammatory systemic disease which may influence numerous tissues and organs but particularly attacks the joints producing an inflammatory synovitis <sup>(2)</sup>. Records show that the occurrence rate of this illness in the grown-up populace is about 1% in the whole ethnic groups, mostly in females where it is a few times more predominant weighed to males <sup>(3)</sup>.

It was recognized that patients with RA are more probably have periodontitis. On the other hand, patients with moderate or severe periodontitis suffer from a greater prevalence of RA than who don't have periodontitis. These bidirectional relationships may be due to the common host immune response and pathobiology <sup>(4)</sup>.

The periodontal pathogen acts as a triggering factor for anti-citrullinated protein/peptide antibodies (ACPA) production in RA. Growing evidence-based suggests that the pathogens related to periodontitis play a significant part in the propagation of RA. With most important organism is *P. gingivalis*<sup>(5)</sup>.

An increasing number of biological and clinical evidence supporting the use of pharmacological approach called "host-modulation therapy" as an aid to mechanical debridement. This treatment is appropriate to the effect of periodontitis on overall health.<sup>(6)</sup> The American Dental Association recently published that the use of host-modulation therapy of small dose doxycycline as an assistant treatment to SRP <sup>(7)</sup>.

Among other available drugs, Novel low-dose preparation 20 mg b.i.d doxycycline (Periostat) is the only host-modulating drug approved by "United States Food and Drug Administration, national regulatory agencies in Canada and Europe" as an adjunct treatment for the management of periodontitis<sup>(8)</sup>.

## SUBJECTS AND METHODS

### Study participants

The study was applied on 20 patients selected from the Department of Rheumatology in Al Zahra hospital, Al-Azhar University randomized controlled study.

### Sample size

Sample size calculation was determined based on statistical power analysis using <http://biomath.info/power> built up on previous study<sup>(9)</sup>. A total sample size of twenty patients (ten in each of the two groups). Total numbers of the patients were divided into two randomized groups.

Group I: It comprised of ten patients of generalized chronic moderate periodontitis and rheumatoid arthritis. These patients were subjected to mechanical debridement only

Group II: It comprised of ten patients having generalized chronic moderate periodontitis and rheumatoid arthritis. These patients were subjected to mechanical debridement added to receiving small dose doxycycline as a host modulatory agent (20mg twice daily) for 3months.

The patients were selected according to selected criteria: Moderate to severe periodontitis with clinical attachment level  $\geq 3$  mm and rheumatoid arthritis activity according to European League Against Rheumatism criteria. The selected patients signed an informed consent explaining all the procedures, also the patients had the right for withdrawal at any time.

### Clinical parameters

Plaque index, Bleeding on probing, Probing depth, and clinical attachment level values were registered for each patient. For Probing depth and clinical attachment level measurements the probe direction was in line with the long axis of the tooth. Probing depth was measured starting from gingival

margin till the base of the pocket. Measurements were obtained by using the graduated periodontal probe called William's probe (with the following graduations: 1, 2, 3, 5,7,8,9 and 10 millimeters) to the nearest millimeter and directed corresponding to long axis of the tooth. Clinical attachment level was measured starting from the cemento-enamel junction till the base of the pocket. The readings were recorded at the same locations of PD.

After the periodontal analyses at baseline, patients of group II received a dosage of 20 mg small dose doxycycline as a host modulatory agent (20mg twice daily) for 3months and later; the periodontal status was reassessed for both groups.

Mechanical debridement was done by manual method using hand instruments. Oral hygiene instructions (OHI) were given for each patient after the periodontal debridement. Participants were assessed throughout every 3 weeks visits during the following 3 months period.

### Gingival Crevicular Fluid Sampling Collection

GCF were collected by placing sterile filter paper strips in the pocket till slight resistance. Filter paper strips were placed in the site with deepest periodontal pocket. The selected area was dried by air and isolated with cotton pellets. Paper strips were maintained in the gingival sulcus for 30 seconds.

### Biochemical evaluation

Gingival crevicular fluid were taken at base line then after 3 months from scaling, root planning and drug administration to assess *P. gingivalis* level by using polymerase chain reaction (PCR).

### RESULTS

Changes in PI of the two groups in the study period has shown that the mean of the group I at the base line – 3months was (78%±23%), group II was (88%±19%), Percent change in Bleeding on probing of the group I at the base line – 3months was (85%±19%), group II was (90%±16%),Percent change in Probing depth of the group I at the base line – 3months was 47%±9%, group II was 60%±6%, Percent change in Clinical attachment loss of the group I at the base line – 3months was 77%±20%, group II was 94%±10%. After 3 months, there was no statistically significant difference among mean % decreases in PI and BOP between the two groups. Group II showed the statistically significantly lowest % decrease in PD, CAL than group I by (p-value=0.004),(p-value=0.028) respectively. Changes in number of bacteria in GCF sample between the two groups in the study period has shown that the mean of percent change in number of bacteria in GCF sample of the group I at the base line – 3months was (30%±12%) and group II was (61%±14%) respectively. After 3 months, group II showed the statistically significantly lowest % decrease in number of bacteria in synovial fluid by (p-value=0.000).

Clinical parameters	Groups	Group I	Group II	Significance test	P value
Percent change in Plaque Index (mean± SD)		78%±23%	88%±19%	Mann-Whitney U test Z=1.03	0.301
Percent change in Bleeding on probing (mean± SD)		85%±19%	90%±16%	Mann-Whitney U test Z=0.59	0.557
Percent change in Probing depth (mean± SD)		47%±9%	60%±6%	Mann-Whitney U test Z=2.85	0.004*
Percent change in Clinical attachment loss (mean± SD)		77%±20%	94%±10%	Mann-Whitney U test Z=2.19	0.028*
Percent change in N. of bacteria in GCF sample (mean± SD)		30%±12%	61%±14%	Student t test t=5.17	0.000*

\*significant difference (p value<0.05).

## DISCUSSION

Periodontal disease and Rheumatoid arthritis have the same character of dysregulation of the inflammatory response by increasing the secretory inflammatory mediators which cause destruction of the periodontium and the synovium. Most of clinical and epidemiological studies have demonstrated that there is a high prevalence of periodontitis and loss of teeth among patients with rheumatoid arthritis<sup>(4,10,11)</sup>.

Despite the potential of adjunctive antimicrobial approaches that contribute to the treatment of periodontitis, the irreversibility of tissue damage is eventually aided by the host response has provoked many investigators to focus on approaches which targeted host signalling pathways. Therefore, adjunctive successful methods have focused on the resolution of periodontal inflammation to periodontal therapy<sup>(12,13)</sup>.

The current study clinical parameters are in agreement with another study<sup>(14)</sup> who have shown that periodontal therapy in RA patients with chronic periodontitis showed enhancement in clinical parameters as evaluated by periodontal indices and laboratory tests. This may be attributed to the effective removal of infection source by subgingival mechanical debridement.

By comparing the percentage of changes of the clinical parameter between the two Groups after 3 months, group II showed the statistically significantly % decrease in probing depth, clinical attachment level than group I by (p-value=0.004), (p-value=0.028) respectively resulting the benefit of small dose doxycycline as a host modulatory drug.

The results of the current study are parallel in the line of the results of randomized clinical trial and meta-analyses. The measurements assessed bleeding index, probing depth, clinical attachment level. They found that the adjunct use of small dose doxycycline to mechanical debridement had further improvements in the treatment of chronic periodontitis<sup>(15)</sup>.

There was a statistically significant difference in the mean of number of *P. gingivalis* in gingival crevicular fluid within both groups from baseline to 3 months. Meanwhile, group II has shown a greater significance decrease than group I (p value= 0.000). These results were parallel to those results by other studies who found that successful treatment of periodontitis showed a significant reduction in the sites occupied by *P. gingivalis* and decrease in the inflammatory mediators<sup>(16,17)</sup>.

## CONCLUSION

The adjunct use of doxycycline as host modulatory drug improved the treatment outcomes when used with mechanical debridement in rheumatoid arthritis and patients with periodontitis.

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