

ASSESSMENT OF PERIODONTAL STATUS IN PATIENTS WITH RHEUMATOID ARTHRITIS IN KELANTAN, MALAYSIA: A PRELIMINARY STUDY

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Abstract

The aim of this study was to assess the association between periodontal status and rheumatoid arthritis in patients of Hospital Universiti Sains Malaysia, in the state of Kelantan, Malaysia. A comparative cross sectional study was conducted on equally 16 rheumatoid arthritis and non-rheumatoid arthritis patients with mean age of 40.8 (SD 16.0) years old. Data on gender, ethnicity, and history of rheumatoid arthritis (RA) were gathered. Periodontal parameters; plaque score, gingivitis score, probing pocket depth, clinical attachment loss and tooth loss were recorded. Data obtained were analysed with SPSS version 22.0 using non-parametric test with $p < 0.05$ taken as significant level.

It was found that all subjects were presented with chronic periodontitis (97%). There was significantly higher number of tooth loss in RA patients compared to non-RA ($p = 0.011$). Tooth loss was significantly correlated with age of the subjects ($r = 0.630$; $p = 0.0001$) and duration of RA ($r = 0.457$; $p = 0.009$). No significant different found for periodontal parameters in between two groups. This limited data demonstrated that rheumatoid arthritis may indirectly influence tooth loss. Further observation is warranted for more conclusive interpretation.

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Introduction

The periodontium is composed of the specialized tissues that maintain the tooth in the socket, namely the gingiva, periodontal ligament, alveolar bone and cementum. Any pathology present in the periodontium will cause progressive destruction of periodontal ligament and alveolar bone with pocket formation, recession or both. Severe form of disease may result in tooth loss¹. Meanwhile, rheumatoid arthritis (RA) is a systemic, inflammatory autoimmune disease that primarily affects the

joints. It produce a non suppurative proliferative synovitis that frequently cause articular cartilage and underlying bone destruction with resulting disabling arthritis^{2,3}. Anti-nuclear antibody (ANA) and rheumatoid factor (RF) are useful parameters for measuring the activity of the disease. The existence of rheumatic or other systemic inflammatory disease may promote periodontal disease in its emergence and progress⁴. The prevalence of periodontal disease (PD) in rheumatoid arthritis patients has been reported as 60%⁵. It has been reported that patients with longstanding active RA have a significantly increased incidence of PD when compared with healthy subjects and that patients with PD have a higher prevalence of RA than patients without PD⁶.

Porphyromonas gingivalis (P. gingivalis) is one of the main microorganisms responsible for the pathogenesis of periodontal disease⁷. *P. gingivalis* produces the peptidyl arginine deiminase enzyme that induces citrullination of various autoantigens. The levels of anti-cyclic

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citruinated protein (anti-CCP) antibodies which are important surrogate markers of diagnosis and prognosis of RA are considerably high in RA patients with periodontal disease, suggesting that periodontitis may contribute to the pathogenesis of RA.

Tumour necrosis factor- α (TNF- α) is one of the inflammatory cytokines which are frequently increased in RA⁸. TNF- α antagonist was believed to reduce the alveolar bone resorption but may perpetuate infection of periodontal pockets. Therefore, rheumatology patients, may get the benefits from referral to dental care (e.g., scaling, root planing and, if needed, dental surgery), particularly as periodontitis is also associated with an increased risk of premature atheroma⁹. There may be a non-causal association between periodontitis and RA due to shared genetics and environment risk factor⁶. Million people with RA are up to four times more likely to develop gum disease than people without RA, and that gum disease also appears to be more severe among people with RA¹⁰. Control of periodontal infection and gingival inflammation by scaling/root planing and plaque control in subjects with periodontitis may reduce the severity of RA¹¹.

A study to determine the association of RA and PD was conducted in Berlin, Germany in June, 2008. The study examined the oral health of 57 RA patients and 52 healthy controls. To determine oral hygiene status, each participant underwent a comprehensive oral examination including an assessment of plaque accumulation and gingival inflammation, both indicators of oral hygiene. Probing pocket depth and clinical attachment loss, two markers of periodontal disease, were also measured. Researchers used questionnaires to gauge the subjects' risk factors for periodontal disease. The study findings indicated that RA patients were nearly eight times more likely to have periodontal disease compared to the control subjects¹².

This present study aimed to determine whether any relationship does occur between RA and periodontal status among patients attending Hospital USM, Kelantan, Malaysia.

Materials and methods

Study population

A comparative cross sectional study was conducted at Rheumatology and Dental Clinic of

Hospital Universiti Sains Malaysia (USM) in Kelantan, Malaysia. Sixteen patients diagnosed with rheumatoid arthritis and 16 patients who had never been diagnosed with RA (non-RA) aged 18 years old and above had participated in this study. Diagnosis of RA was according to American College of Rheumatology/European League against Rheumatism (ACR/EULAR)¹³. Patients who had uncontrolled medical conditions such as diabetes mellitus, hypertension and blood disorders; pregnant women, user of drugs influencing periodontal tissues (eg: phenytoin, cyclosporin, nifedipine) were excluded. All patients were non-smoker and having more than six teeth present. All subjects were recruited on voluntary basis and informed written consents were taken. Data on age, gender, ethnicity, duration of rheumatoid arthritis and rheumatoid factor result were obtained from patients' medical record. The study protocol has been approved by Human Research and Ethics Committee, USM (USM/JEPeM/15060201).

Oral assessment

All patients underwent full-mouth periodontal examination to determine periodontal status. The parameters used were plaque score (PS), gingivitis score (GS), periodontal pocket depth (PPD), clinical attachment loss (CAL) and loss of teeth (an indirect indicator for periodontitis). All measurements were performed by using Michigan "O" periodontal probe with Williams marking at 1, 2, 3, 5, 7, 8, 9, and 10mm grading. For PS¹⁴ and GS, the presence of plaque and bleeding on probing (BOP) respectively were recorded for 4 surfaces of the tooth which are on mesial, distal, buccal/ labial and lingual/ labial. The total number of tooth surfaces with presence of plaque and also BOP were counted; the sum is then divided by the number of all tooth surfaces in concern (including pontics and implants), and multiplied by 100 in order to establish the PS and GS as a percentage. Meanwhile, the PPD and CAL were measured on 6 sites of each tooth namely distobuccal, midbuccal, mesiobuccal, mesiolingual, midlingual and distolingual. All measurement including the number of missing teeth was charted in the periodontal chart.

Diagnosis for chronic periodontitis was made clinically according to American Academy of Periodontology¹⁵, where severity was based on the amount of clinical attachment loss (CAL) and was recorded as mild (3-4 mm CAL) or

moderate to severe (> 5 mm CAL).

Statistical analysis

All data were analysed in SPSS version 22.0. Descriptive analysis was calculated and was expressed as median and interquartile range (IQR) due to small sample size. Comparison of periodontal parameters between RA and non-RA was done using Mann-Whitney test and the association between severity of periodontal disease and rheumatoid factor was done by using Fisher's exact test. The significant level was set at $p < 0.05$ at 95% Confidence Interval (CI).

Results

Subjects characteristics

A total of 32 subjects with mean age of 40.8 (SD16.0) who had fulfilled the inclusion and exclusion criteria was participated in this study. Majority of the subjects were Malay (84.4%) in which most of them were female (84.4%). Table 1 summarizes the demographic characteristics of the study subjects.

There were 15.60% subjects suffered with RA more than 5 year duration. All RA patients were undergoing regular follow-up under Rheumatologist at Rheumatology Clinic, Hospital USM.

Characteristic	Frequency (%)		Median (IQR)	
	RA n=16	Non-RA n=16	RA n=16	Non-RA n=16
Age (years)			51.50 (26.0)	30.50 (19.0)
Gender				
Male	2 (12.5)	3 (18.8)		
Female	14 (87.5)	13 (81.3)		
Ethnicity				
Malay	11 (68.8)	16 (100.0)		
Chinese	4 (25.0)	0		
Others	1 (6.3)	0		
Duration of RA (years)			4.00(12.0)	-
≤5 years	11(68.8)	-		
> 5 years	5 (31.3)	-		
Positive Rheumatoid Factor	4 (25.0)	-		
Negative Rheumatoid Factor	12 (75.0)	-		

RA: Rheumatoid arthritis

Table 1: Demographic characteristics of the study subjects.

Oral health parameters

The result shows all RA and 93.80% of non-RA subjects were diagnosed with chronic periodontitis (CP). Both groups showed more than 60% of patients having mild form of CP (Table 2). Fisher's Exact test calculated for 2x2 table revealed no significant different in the severity of CP between RA and non-RA subjects ($p=1.00$). Table 3 shows comparison of PS, GS, PPD, CAL and tooth loss between RA and non-RA patients.

Severity of CP	RA n= 16	Non-RA* n= 15	x ² -statistic† (df)	p-value
Mild (% of sites 3- 4mm CAL)	10 (62.5%)	10 (66.7%)	0.81 (1)	1.00
Moderate to severe (% of sites > 4mm CAL)	6 (37.5%)	5 (33.3%)		

CP: Chronic periodontitis; RA: Rheumatoid arthritis

*Only 1 out of 16 subjects has no CP

†Fisher's Exact Test

Table 2: Severity of chronic periodontitis in rheumatoid arthritis and non-rheumatoid arthritis patients.

Variables	RA Median (IQR)	Non-RA Median (IQR)	Z-statistic	p-value
Plaque score (%)	38.65(32.0)	37.19(34.0)	-0.075	0.940
Gingivitis score (%)	16.97(11.86)	21.49(13.8)	-0.942	0.346
Probing pocket depth (mm)	1.72(0.41)	1.70(0.52)	-0.019	0.985
Clinical attachment loss (mm)	0.18(0.92)	0.12(0.64)	-1.558	0.119
Number of tooth loss	4.00(4.0)	0.50(4.0)	-2.546	0.011

RA: Rheumatoid arthritis

*Mann-Whitney test

Table 3: Comparison between periodontal parameters in rheumatoid arthritis (n=16) and non-rheumatoid arthritis (n=16) patients.

There were no significant differences in periodontal parameters except significantly higher number of tooth loss in RA patients compared to non-RA ($p=0.011$). Further analysis using Spearman's rho non-parametric correlation test found that tooth loss was significantly correlated with age of the subjects ($r=0.630$; $p=0.0001$) and duration of RA ($r=0.457$; $p=0.009$). Analysis of association (Table 4) showed that no significant association between severity of

periodontal disease and rheumatoid factors ($p=1.000$).

Rheumatoid Factors	Mild CP n= 10	Moderate to severe CP n=6	χ^2 -statistic [*] (df)	p-value
RF +ve (≥ 12 IU/mL)	3 (75.0%)	1 (25.0%)	0.55 (1)	1.00
RF-ve (< 12 IU/mL)	7 (58.3%)	5(41.7%)		

RF: Rheumatoid Factor
 CP: Chronic periodontitis
^{*}Fisher's Exact Test

Table 4: Association between severity of chronic periodontitis and rheumatoid factors.

Discussion

The relationship between rheumatoid arthritis and periodontal disease has been a growing interest among researchers. Many studies have been done regarding this topic but there is lack of data in our population. Thus this pilot study was conducted to determine the relationship between rheumatoid arthritis and periodontal disease among selected Malaysian population.

In this study, it was found that all subjects in both RA and non-RA group had periodontal disease although the median age was much younger in the non-RA. However most of them were in the early stage of CP (Table 2) which reflects that the clinical attachment loss was mainly less than 4mm. This finding is in accordance with the survey done in Malaysia¹⁶ which demonstrated 96.7% of adult population suffered with periodontitis. Several studies show that the prevalence and severity of periodontal disease increase with age¹⁷. Other factors such as lifestyle, systemic involvement and environmental effect might also influence the emergence of periodontal disease. Lifestyles that may influence development of periodontal disease are smoking, tooth brushing techniques and diet. Moreover, systemic involvement such as uncontrolled diabetes mellitus and hormonal changes may contribute in disease development. Plaque score is assessed to reflect the oral hygiene status of a patient whereas the gingivitis score determined the inflammatory status of the gingiva. In this present study we found that there were no significant differences of plaque score and gingivitis score between RA and non-RA patients. It can be stated that all subjects were

having fair oral hygiene which is consistent with mild gingival inflammation based on their median plaque score level and gingivitis score less than 40% and 25% respectively. Persistent plaque accumulation may cause systemic inflammatory response which in long term may manifest as periodontitis¹⁸. All subjects in this present study will benefit with oral hygiene education and full mouth scaling.

This current study also showed insignificant different of CAL and PPD between RA and non-RA patients. Most of them were in the mild form of CP (Table 2) according to sites with CAL of 3-4mm¹⁵. In contrast Abou-Raya et al. demonstrated an association between RA and CP in which RA patients with coronary artery disease had significantly more periodontal destruction¹⁹. There is study suggested that pathogenic mechanisms behind periodontal disease, including the gingival inflammatory infiltrates and bone destruction, resemble those observed in rheumatoid arthritis patients²⁰. Nevertheless, in this study subjects, probing pocket depth may be resolved by non-surgical periodontal therapy such as oral hygiene instruction, full mouth scaling and root planing²¹. Interestingly, the number of missing teeth was found to be significantly higher in RA compared to non-RA patients. This is supported by a research conducted on a large US population that those individual diagnosed with RA has 80% more chance of presenting sign of periodontitis and increased tooth loss²². In another study, a significant correlation in teeth loss and alveolar bone loss was found in patients with RA, and this may well represent various aspects of periodontal health²³. Tooth loss was considered as surrogate marker for periodontal disease although it may be due to other causes as well such as caries and this was not rule out in this present study⁶.

The number of tooth loss also showed positive relationship with age of the subjects and duration of RA. It was demonstrated that tooth loss associated with incident of RA might only be relevant among those with existing periodontitis or oral infection/inflammation²⁴. Further analysis is recommended in future study with bigger sample size to control any confounding variables that might influence the true relationship between missing teeth and rheumatoid arthritis.

This present study shows no significant association between severity of periodontal

disease and rheumatoid factor ($p=1.000$). By contrast, a study by Dissick et al. in 2010²² reported that RA patients who have positive rheumatoid factor were more likely to have moderate to severe periodontitis (59%) compared to patients with negative rheumatoid factor (15%) ($p=0.02$). In some cases, presence of periodontitis in patients with RA is associated with seropositivity for RF and the anti-CCP antibody, which have high association with the pathogenesis of the disease and indicates poor outcome of RA²². Therefore, RF and anti-CCP antibody are important biomarkers for early detection of the RA²⁵.

This preliminary study comprised small number of sample size. Thus, a cause and effect relationship cannot be established and the findings might not be enough to reflect the actual population. A larger-scale and longitudinal design of study is recommended for future research to elucidate the association between these common chronic inflammatory diseases and therefore would provide more promising findings.

Conclusions

There is little evidence to support periodontal disease association with rheumatoid arthritis. The number of missing teeth might have some relationship with rheumatoid arthritis however further investigation is required before such conclusion could be drawn. Nevertheless, we suggest that collaboration between rheumatologist and dentist should be heightened in order to ensure optimum oral health care of RA patients.

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Declaration of Interest

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